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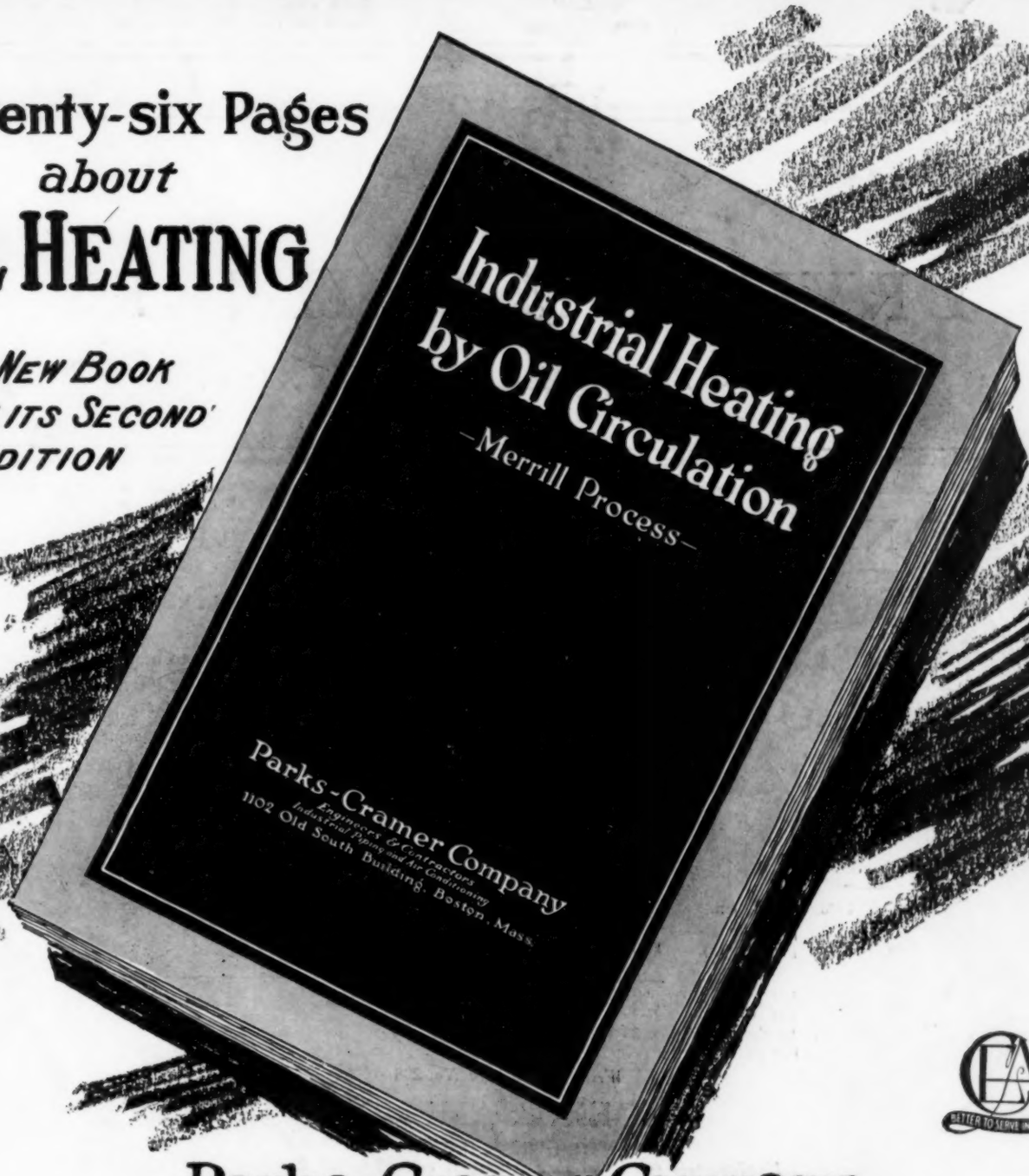

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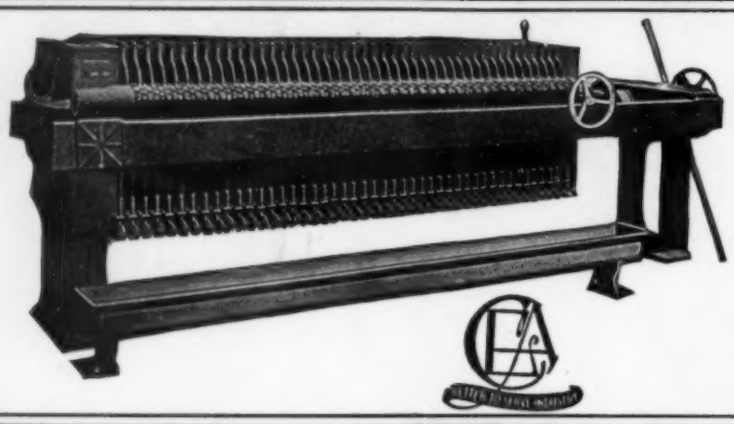

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H. C. PARMELEE, Editor

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A Message To Industry

PRESIDENT COOLIDGE'S message last week to the Sixty-eighth Congress was essentially an inspiration to industry. As the first public utterance of principles by one whose candidacy to succeed himself is almost certain to be before the electorate next November, the message is of tremendous political significance. But to analyze it and to interpret it from this point of view is a privilege that can well be left to those whose profession is politics, whose pleasure is criticism and debate. It is from industry's interest and from the viewpoint of the engineer that the document holds our attention.

Our great national problems are industrial. Taxation, transportation, coal, power, immigration—these are the factors on which our industries are dependent and it is with their underlying fundamentals that the President deals. There can be no misunderstanding of his words. They can have left no doubt even in the benighted minds of his immediate auditors. Sweeping generalities and the pompous phraseology that so often characterize such messages are lacking. In their stead are short, terse sentences that mean business and reflect character and decision. More is said, for example, in the ten-word paragraph "But I do not favor the granting of a bonus" than is contained in ten pages of Congressional argument and explanation.

The doctrine of good business pervades the entire message. Taxes must be reduced, the outlay of government funds curtailed, and ill-advised and other uneconomic burdens that hamper business must be lifted. In most instances it is apparent that President Coolidge has very definite ideas how these are to be accomplished. He gives his unqualified approval to the Mellon plan of tax reduction, appraising its importance in this significant and characteristic comment:

> The taxes of the nation must be reduced now as much as prudence will permit, and expenditure must be reduced accordingly. High taxes reach everywhere and burden everybody. They bear most heavily on the poor. They diminish industry and commerce. They make agriculture unprofitable. They increase the rates on transportation. They are a charge on every necessary of life. Of all of the services which the Congress can render to the country, I have no hesitation in declaring this one to be paramount. To neglect it, to postpone it, to obstruct it by unsound proposals, is to become unworthy of public confidence and untrue to public trust. The country wants this measure to have the right of way over all others.

The budget system, already the law of the land, is one of the roads toward the "constructive, scientific, economy" that good business demands. It is particularly fitting that the Congress that will pass on next year's appropriations be reminded that the instrument of its own creation should be strengthened by the example of its own observance.

The vital issues that complicate our transportation problem are squarely faced by the Executive. In the case of the railroads he holds that the transportation act must be continued, although a reorganization of the entire rate structure is essential and certain consolidations must be legalized. It is recognized that the Labor Board's present method of adjusting wages is not all that is to be desired, but of necessity it must serve until a better scheme is proposed. Much the same arrangement must apply to shipping. Our national defence as well as commerce demands an adequate merchant marine, and, for the time being, "we shall have to pay the cost of its service."

In keeping with the general tone of the message, reference to the tariff is brief and to the point, reflecting for the most part the views made public by President Harding early in his administration. Constant revision of rates by Congress is detrimental to the conduct of business and furthermore the so-called flexible provisions of the new law should be invoked by the President only when inequalities and injustices arise from the operation of the original act.

Naturally, from a political point of view, Muscle Shoals finds a prominent place in the President's message. Actually it is discussed at greater length than are a dozen other problems of most serious national concern. However, certain of the real issues involved in the Ford offer, such as his 100-year amortization plan, have elicited no comment from the Chief Executive. Yet he does lay stress on the necessity for a guarantee of fertilizer production. Incidentally the technologist will appreciate highly the hearty indorsement to fixed nitrogen research which is carried by these words:

> To obtain a supply [of nitrates] from this water power would require long and costly experimentation to perfect a process for cheap production. Otherwise our purpose would fail completely. It seems desirable, therefore, in order to protect and promote the public welfare, to have adequate covenants that such experimentation be made and carried on to success.

To be sure, there is much else in the President's message deserving of the attention and serious study of our industries. Reference to the document would fail of completion without an appreciation of his searching analysis into the plight of the farmer and the sound advice given to this, the country's most basic industry. And, too, the policy toward foreign relations contains a great deal more of logic than the politician is likely to credit to it. But after all the message is one of principal concern to industry and as such, a tonic that should stimulate a sane and logical development of business.

Commendable Co-operation Of Governmental Agencies

ON MANY occasions in times past there has been strong evidence of inter-bureau or inter-department jealousies in Washington. Occasionally there has been ground for the belief that the Bureau of Mines and the Bureau of Standards have not been altogether happy on certain points where the technical and scientific fields of the two bureaus join or overlap. Just lately, however, we have had an example of real co-operation between these two institutions. This example comes to us through the recent meeting of the advisory committee on non-ferrous alloys, which is now serving jointly these two government bureaus.

This common service by a single committee to two bureaus insures a closer co-operation on the part of government men and a better co-ordination of their research effort. Moreover, it insures industry, which is well represented on this advisory committee, that the technical and scientific work of the two laboratories will be properly co-ordinated with industrial affairs and that there is no likelihood of one bureau undertaking work or reaching important conclusions strikingly in conflict with the other.

Nitrogen Research And Muscle Shoals

THE supply of fixed nitrogen is of tremendous importance—technologic, economic and military. The great commotion that has been made regarding the Muscle Shoals nitrate plants might lead one to believe that the proper disposition of those properties would solve the whole question. Of course any such conclusion is very far from the fact. Further research and development continued indefinitely are vastly more important to the government, to industry and to the agricultural community than even the most optimistic and successful arrangement for the Muscle Shoals properties.

Chem. & Met. has consistently stressed the importance of research in highly technical problems like nitrogen fixation. We again emphasize this aspect of the subject. And in order that all of our readers may have a full understanding of this phase of the matter we present elsewhere in this issue a résumé of the research work of the Fixed Nitrogen Research Laboratory.

Some enthusiasts for the Ford offer to take over Muscle Shoals have gone so far as to contemplate the abandonment of government research on nitrogen. Such an extreme view is, of course, preposterous, but it has seemed worth while to ascertain the attitude of our legislators on this point. Representative Madden, chairman of the Appropriations Committee of the House of Representatives, has characterized this proposal as "absurd." He says, "To accept such a conclusion, one would have to believe that Congress is even crazier than our bitterest critics claim."

The Fixed Nitrogen Research Laboratory has done work of great fundamental importance and of direct practical application. It has already contributed valuable information regarding the proper catalyst to use in the direct synthetic ammonia processes. It has gone so far in a practical way as actually to supply some of this catalyst for commercial plant work. It far exceeds in efficiency any similar material prepared in connection with German plant operation, and no American workers have approached the same degree of success.

The laboratory has also made very definite steps forward in the design of small-scale nitrogen-fixing equipment. This type of apparatus is intended for use in plants where hydrogen is available as a byproduct. For this work plans are being drawn and extensive commercial work is contemplated by several companies, in co-operation with the laboratory. As a result there will undoubtedly be very definite progress which would not have been possible without the research that has been done at this institution.

Research on nitrogen fixation will continue and this laboratory will have an important part in it. Nitrogen will for many years, perhaps indefinitely, be a subject worthy of our best skill both in industry and in government scientific institutions. And only as the highest scientific skill available is applied in the study of these problems may we expect the maximum industrial progress.

Speeding Up The Census

ON JULY 1, 1922, field work was completed on the 1921 census of manufactures—the first of the biennial surveys made in accordance with the law of March 3, 1919. The Bureau of the Census thus established a record which, considering the enormity of its task, is one that has never before been approached in the history of the government. When operating on the 5-year basis, formerly in effect, from 18 months to 2 years was normally required for completing this phase of the work.

While much of the credit must go to the governmental agency and to the officials responsible for its efficient reorganization, the fact remains that the accomplishment was possible only because the various manufacturers actively co-operated in supplying the necessary data in time to be of current value to industry. Past delays have been due almost entirely to the individual producers who have neglected to make out their reports. In these cases the government is put to the expense of following up the original inquiry with letters and telegrams, and not infrequently it is necessary to send special agents to the establishment in order to unearth the desired information.

Shortly after the first of January the various industries and trades will be requested to make their returns for the calendar year 1923. The census forms, or schedules as they are more correctly called, have just been prepared after extended conferences with manufacturers, trade associations and representatives of the technical press. Every attempt has been made to reduce the number of inquiries to a workable minimum and to make the schedule correspond as nearly as practicable with the manufacturers' usual methods of keeping production and sales records. The bureau has promised to handle the reports even more expeditiously than was the case in the 1921 census. The data will be tabulated as rapidly as the schedules are returned and publication will be authorized within a few days after the last report has been received.

It is thus apparent that the Census Bureau has gone more than half the way in its co-operation and service to industry. The stage is now set for new records of statistical service. It remains only for the individual manufacturer to do his part in making certain that the program is not delayed by his own failure to return promptly the government's request for information.

Is a Double Standard For Metals Justified

NO LESS an authority than G. K. Burgess, director of the Bureau of Standards, raises the question as to the propriety of continuing double-barreled requirements for metals. In his address as president of the American Society for Testing Materials this eminent metallurgist made the following comment:

"If in Europe they can get along satisfactorily without chemical specifications for steel, is it not a waste for us to insist upon them if by so doing we increase the cost of production without getting a more satisfactory product? This question I believe this society, with other specification-making bodies, will have to meet some day for certain of the products in which it is interested."

The metal user as well as the metal producer must seriously consider this question. If he is unnecessarily adding chemical requirements to physical requirements for steel or other metals, he is inevitably adding to the cost of their production and to the price which he must pay. In fields other than metallurgy performance specifications serve most satisfactorily. Why should this not be true of metals? When we specify tensile strength, elongation, hardness and other physical characteristics essential to the service intended, why should we go on and add limits to carbon, sulphur, phosphorus, manganese, silicon and other constituents?

In some cases, to be sure, we cannot by physical test define completely the performance requirements. Under such circumstances an additional chemical requirement increases the certainty of getting the desired quality of metal and no one would question the need of the chemical specification. But under many other circumstances these conditions do not prevail, and then it is desirable for the user to stop and consider whether he should not limit the number of requirements which he makes of the metallurgist, in order that there may be economy in manufacture and minimum prices.

The Dependence of Industry on Research

THE recent 3-hour conflagration that devastated the residential section of Berkeley, Calif., and laid to waste some of the most picturesque homes in the United States at the rate of three per minute should carry a lesson to architects, legislators and property owners on the absurdity of permitting the continued use of a highly flammable material on outside building construction. We refer particularly to ordinary wooden roofing shingles. These curl in course of time, but the average home owner postpones repair until leakage occurs and replacement of the roof is necessary. It may be stated with assurance that the spread of the fire at Berkeley was greatly facilitated by the ease with which buildings were ignited by sparks blown in under curled shingles. This fact has now been recognized, and the further use of shingles on new roofs is prohibited.

To industry in general, however, the disaster carries a deeper and more significant lesson. The lumber trade has prospered exceedingly. Continued opposition to the use of wooden shingles on roofs, to the end that prohibitory legislation might be enacted, has been met by lobbying propaganda and other well-known methods of influencing public opinion. In the end, however, common sense must prevail, as those who advocate force rather than reason should realize. The lumber industry has lost an important outlet for trade, and we believe that it has been lost mainly because of neglect of the value of scientific and technical research.

What has been done to render wooden shingles fireproof, or at least fire resistant? Is the problem beyond solution? We hardly think so. The roofing now being used most extensively on new houses in the Berkeley district contains as an essential constituent one of the most flammable substances known—a byproduct of petroleum refining; but technical research has perfected a method of use whereby the finished article is fire resistant, and its use is permitted by the authorities.

The lumber industry won't collapse over night in consequence of the prohibition of the use of wooden shingles at Berkeley; but competition is growing keener day by day, and the directors of all industries must realize that it is the plant the operations of which are controlled by adequate chemical and mechanical supervision that wins out in the end.

To those who realize the immense possibilities in the manufacture of byproducts from what is generally considered waste material the most pathetic sight in modern industry is the pile of burning lumber ends and sawdust found near almost every mill in our forest country; some of these have been alight for 10 years or more. Sooner or later the lumber industry will realize the value of adequate research. Immediate prosperity is no excuse for indifference, but rather the reverse; for no other investment is so profitable in the long run.

German Methods For Making Alcohol

"MANY of my friends are highly delighted in your article," we read in a communication that cost a billion marks (more or less) to mail, "and chemists here, who have it analyzed, declare it to be very good." Were we inclined to be unscrupulous, we might use the quotation to further our own ends; but, though the opinion comes from Philadelphia, it arrived by way of Munich, and the phraseology evidently suffered en route. And, lest there be misconception, the "article" referred to is not a contribution to *Chem. & Met.* but a "dry substance, without a trace of alcohol," from which it is guaranteed that one can "regenerate the original beverage" from which it was made and "rejoice within a short time and without a still the enjoyment of a guaranteed full-bodied production, which will be a source of constant pleasure and comfort." And, lest we be afflicted with qualms of conscience, it is emphasized that alcohol is not being sent, "but a substance from which you can prepare the various beverages with their regular, usual content of alcohol." The offer, it is averred, "does not interfere with the laws of your country."

The final statement is substantially correct and the logic is unassailable. No offer of this character is likely to interfere with the laws of this country. Even if accepted—we understand from a few deluded individuals who have fallen into the snare laid by our wily Teuton friends, and sent the money—nothing more happens. The closing scene to the incident is doubtless played at Munich, where a good American dollar will buy countless billions of marks and many gallons of beer. And, as a result of the transaction, the smile, as it were, will be "on the face of the tiger."

The Engineer And the Public Service

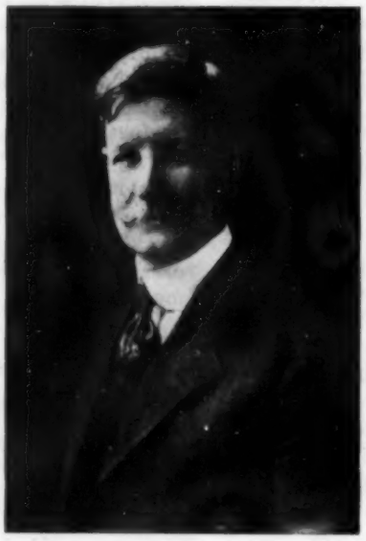
How the Engineering Profession Should Conduct Itself in Order to Fulfill Its Manifest Public Duty

EVERY so often it is the moral obligation of the engineering profession to scan, so to speak, its engineering horizon, in order to ascertain whether the bounden fruits of the public trust it holds by reason of its education and opportunities are being gathered for the general benefit. When such a survey is to be made, it is well to turn for help to one who, by reason of his place in the profession, is in a position to obtain that broad view which others of us, absorbed in the detail of industry, cannot obtain.

Such a man in such a place is John Lyle Harrington, president of the American Society of Mechanical Engineers. In the annual presidential address, given last Monday evening at the opening of the annual meeting of the A.S.M.E., he took occasion to place before us the results of a year's nationwide survey of the engineering profession.

According to Mr. Harrington, the engineer, immersed in the intricate detail of his technical pursuits, has too long withheld from the public service the benefits which his peculiar talents enable him to confer. Much can be done by the engineer to allay that unrest so evident among the nation's workers. And unwise handling of government and business could be largely remedied by the application of engineering methods.

Unrest among the workers is largely chargeable to that American attitude which deprecates manual labor. "Apparently it is expected that the American, with his superior cultural education, will make his way by his wits without soiling his hands. He is barred by his false social ideals and by his lack of training from those profitable and honorable fields of industry which involve manual labor."



J. L. Harrington
President American Society of Mechanical Engineers

Again, though "engineers are beginning to employ their specialized talents in the public service, the country is still governed by the military and legal professions, aided somewhat by the business man. These facts have retarded the progress of political development, for the lawyer lives by precedent. The engineer with his constructive, creative scientific mind is sorely needed."

"The engineer . . . has failed to develop his ability and to establish his position in the other leading factors of life [besides industry] to which he is entitled by virtue of his part in production and the welfare resulting therefrom."

Admitting, as we must, the justice of Mr. Harrington's charges that the engineer does not play the part he in duty should, wherein lies the remedy? In the hands of the engineer!

He should, in the first place, do everything within his power to take such a place in public affairs that his abilities may be used to the utmost for the public good. But, it may be objected, most engineers are not fitted either by training or experience for the public service. True. Therefore, engineering education must be revamped so that they shall be so fitted. It is the present care of the leaders of the engineering profession to work for such changes in the curricula of our engineering schools that in the future the graduates will be able to stand shoulder to shoulder with the lawyer and the soldier in the conduct of the public business. And finally, until such time comes, engineers should, through their great technical societies, work together to discharge as much as possible of the debt of service they owe the community in return for their education and opportunities.

Accomplishments in
Research on Nitrogen Fixation

Status of the Various Processes Is Discussed by the Staff of the Fixed Nitrogen Research Laboratory

Nitrogen fixation is always an important subject. Just now it is particularly timely, because of the active discussion of the best means for utilizing the two nitrate plants at Muscle Shoals. In order that reliable information regarding the importance of research and further technical development on nitrogen fixation should be available, *Chem. & Met.* has summarized the situation briefly with the assistance of the staff of the Fixed Nitrogen Research Laboratory. It is evident from this review of the situation that the disposal of Muscle Shoals is only one of many problems still before us in the matter of adequate cheap supplies of nitrogen for fertilizers, military uses and our industries.

IT HAS justly been said that man has passed through the stone age, the bronze age and the iron age, and now is in the nitrogen age. Indeed the experiences of the past few years have taught us that no nation can be great either in peace or in war without an adequate supply of fixed nitrogen. Not only must an adequate supply of nitrogen be secured in war to meet the greatly increased military demands, but even the peace-time requirements of nitrogen must come in increasingly greater proportion from sources other than natural deposits.

Beginnings of "Atmospheric Nitrogen"

Recognizing the national importance of the nitrogen question, Congress on June 3, 1916, passed the national defence act, specifically authorizing the President to make such investigations as in his judgment were necessary to determine the best, cheapest and most available means for the production of nitrates. This act may be considered as the first step of a governmental plan for solving the nitrogen problem. As a second step came a rapid but painstaking investigation of what was then known concerning methods of nitrogen fixation. These investigations led to the erection of two nitrate plants near Muscle Shoals, the government's third step in solving its problem of nitrogen supply. The fourth step was the post-war effort to make effective use of these plants; and the latest, or fifth step, is now being taken in the nitrogen investigation as a part of the raw materials survey of the Department of Commerce.

Other countries had found themselves in a similar situation and the universal rush to erect and operate plants for the fixation of atmospheric nitrogen is now a familiar story. Germany has far outstripped other countries in providing a domestic source of fixed nitrogen, though many of the latter are making notable progress. Almost at the start of the war Germany was completely cut off from Chile, although at the outset she, with but a few ships, prevented exportations from Chile to her enemies for several months. The allied nations realized the possibility of being partly or wholly cut off from Chile as a source of supply. The coke and gas industries could be but little increased; in fact in France and Belgium, due to enemy occupation of the coal fields, the nitrogen from this source actually decreased to approximately 30 per cent of pre-war supply. There was but one thing left to do, therefore; that was to turn to the fixation of atmospheric nitrogen. As a result, although the world's nitrogen consumption increased between 1913 and 1918 from 808,031 to 1,285,398 net tons, or 59 per cent, the proportion derived from Chile and from coal decreased, while that as fixed atmospheric nitrogen increased until the atmosphere supplied a greater percentage of the nitrogen consumption than either of the other sources. The fixed nitrogen industry was thus established in the world and in 1922 we find the consumption of 875,000 net tons of inorganic nitrogen made up of 24 per cent from Chilean nitrate, 35 per cent from the coke and gas industry and 41 per cent from the atmosphere. In the United States in 1922, 179,000 net tons was used, with production from coke and gas of 58 per cent and atmospheric plants 3 per cent of this amount.

In the peace-time development of actual producing plants for nitrogen fixation the United States has taken practically no part, less than 3 per cent of our present requirements being supplied by the fixation of atmospheric nitrogen within our borders. This will be appreciated from the accompanying chart, showing the growth of the fixed nitrogen industry in Germany from 1913 to 1922, in comparison with the development of the art in the United States. The chart represents also the United States Nitrate Plant No. 2 at Muscle Shoals, 40,000 tons capacity, which shows that even though the Muscle Shoals plant were now operating we would then be producing but 20 per cent of our annual consumption in fixed nitrogen.

Purpose of F.N.R.L.

From these figures it is quite evident that no large nitrogen industry exists in this country today in spite of our ever-increasing requirement. It is all the more imperative, therefore, that we should at least obtain a thorough technical knowledge of all processes now in operation and should vigorously prosecute research to

keep us abreast of developments in the art. In recognition of this need, and serving as the fourth step in the government's plan for solving the problem of nitrogen supply, the Fixed Nitrogen Research Laboratory was established by the Secretary of War, March 29, 1919, to co-ordinate and make permanently useful the knowledge of nitrogen fixation gained by the government during the war, to obtain information necessary for the peacetime utilization of the government nitrate plants at Sheffield and Muscle Shoals, Ala., and, most important of all, to study the fixation and utilization of nitrogen as a basis for intelligent encouragement and guidance of the industry. On July 1, 1921, the Fixed Nitrogen Research Laboratory was transferred by Executive order to the United States Department of Agriculture.

The investigations of the laboratory embrace the whole field of nitrogen fixation and thus, while the major attention of the laboratory is devoted to developmental studies of well-recognized processes, it is also investigating the merits of other possible methods.

Arc Process

The arc process is the oldest and simplest of the commercial processes for nitrogen fixation. Air is passed through a powerful electric arc discharge and the resulting brown nitrous gases are collected in water or other absorbents, forming nitric acid or nitrates. The laboratory is studying the arc process from the standpoint of the physicochemical basis of the reactions involved in the process with a view of determining factors which limit the process as at present used. This has necessitated extensive investigations of the production of ozone, nitric oxide and active nitrogen in the electric discharge. Also the physicochemical properties of these substances are being investigated.

It is perhaps fair to state that the arc process has progressed little if any in 20 years. In fact basic physical and chemical research is needed before any real advance can be made. Thus the effort of the laboratory has been on the fundamentals.

The laboratory has also made decided progress in the development of a process by means of which the expensive towers heretofore used for absorbing the gases may be replaced by inexpensive and efficient apparatus. This improvement is also applicable to the process by which nitric acid is made from ammonia. Advances in related industries may come, therefore, as well as direct benefits.

Cyanamide Production

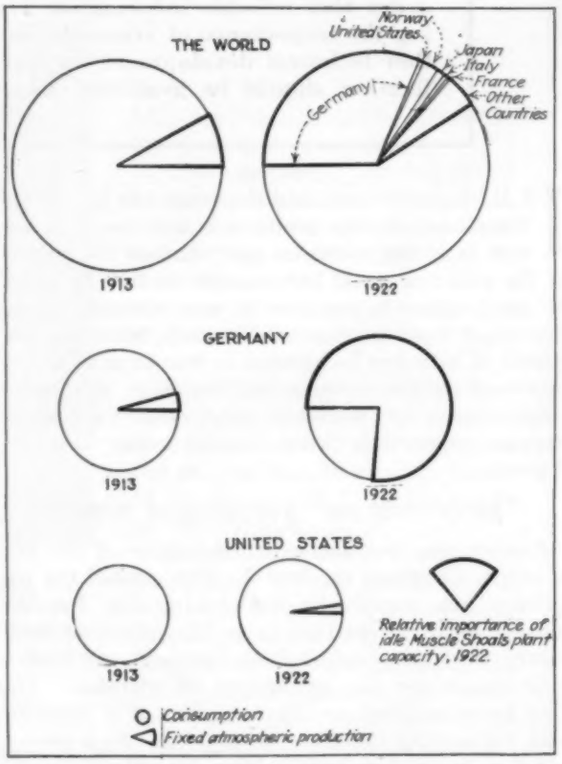
The cyanamide process, and the utilization of cyanamide for agricultural and other purposes, has been the subject of extensive investigations by the laboratory. This was occasioned not only by the importance of cyanamide in the world's nitrogen fixation industry but also by the government's ownership of a huge cyanamide plant, the largest in the world, at Muscle Shoals, Ala.

The present importance of the cyanamide industry is shown by the fact that plants with a total productive capacity of about 275,000 tons of fixed nitrogen exist in twelve countries. This represents about 40 per cent of the world's present fixation capacity. Plants are in operation in ten countries, with an actual output of about half this total productive capacity. It is evident that the industry, while not now expanding, is a very large one.

The cyanamide process has now been established for about 17 years and hence offers less opportunity for improvement than a newer process such as the direct synthetic ammonia process. However, the laboratory has made a thorough study of the two main parts of the process—namely, carbide formation and cyanamide formation—to ascertain what reduction in costs, if any, can be reasonably expected. The general conclusion has been reached that while carbide production, now an old and standardized process in itself, does not offer much opportunity for reduction in cost, a very material saving can be effected in cyanamide formation. A drastic reduction in the present cost of fixing nitrogen by this process, however, seems doubtful.

Utilization of Cyanamide

The utilization of cyanamide not only as fertilizer but also for industrial and military purposes is an exceedingly important problem, since cyanamide is a relatively cheap source of a great variety of nitrogen compounds. A scientific basis for such utilization has been



Relation of Fixed Atmospheric Nitrogen Production to Total Inorganic Nitrogen Consumption

laid by the laboratory through a very complete study of the chemistry of cyanamide and many of its products. In connection with the use of cyanamide as fertilizer, investigations have been made on all phases of the problem, even including chemical and biological changes which cyanamide and its derivatives undergo in the soil and large-scale fertilizer experiments.

Since cyanamide is the direct product of the cyanamide process, it is a much cheaper form of fertilizer nitrogen than ammonia salts made from it. Hence the laboratory has made every effort to eliminate as many of the limitations to its general use as possible. In the latter connection a complete study was made on the production of calcined phosphate, a new form of agriculturally available phosphate not yet on the market. This phosphate, unlike acid phosphate, which is now so extensively used in mixed fertilizers, can be safely mixed in any desired proportion with cyanamide, thus removing one of the limitations to the more extensive

use of cyanamide as a fertilizer in this country. It appears that this phosphate can be produced as cheaply as acid phosphate, if not more cheaply, and it has the further advantage that it contains about 25 per cent available phosphate as against 16 per cent in acid phosphate.

Methods have been developed for the production of a number of compounds from cyanamide which are becoming important from the industrial and military point of view.

Direct Synthetic Ammonia Processes

Haber, Claude, Casale, Fauser and other processes belong in this group of direct synthetic ammonia processes. The problems involved in them may be divided into two groups: First, those that concern the process for making hydrogen combine with the nitrogen of the air to form ammonia; and second, those that concern the process for manufacturing and purifying the hydrogen-nitrogen mixture employed in this synthesis.

The principal problem of the first group centers about the catalyst. In fact, the nature of the entire process is largely dependent upon the catalyst's characteristics. The laboratory has developed a very reactive and stable catalyst which so far as it has been able to learn is superior to any other obtainable. This is borne out by the interest taken by the nitrogen industry of this country, which is, for the most part, either using this catalyst or negotiating for its use. This catalyst has aroused interest also in the foreign countries employing the direct synthetic process and rights for foreign use have been applied for. A method for commercial manufacture of this catalyst has been developed and is available to the industry. The problem of the mechanism of catalytic action is now being vigorously attacked with the hope that results of these investigations will lead to further improvements of the catalyst.

The laboratory is carrying out metallurgical tests on materials employed in the construction of apparatus used in the synthetic ammonia process with a view to lengthening the life of these materials when exposed to nitrogen, hydrogen and ammonia mixtures. The results of these tests have indicated a special alloy steel as being the most suitable.

The design and operation of commercial plants have been studied by the laboratory with a view to decreasing the cost of operation. The results of these studies are eagerly awaited by the industry and no doubt will result in increased efficiency of operation. These studies include such problems as design of catalyst bomb, high-pressure circulating pump with special lubrication, manually and automatically operated high-pressure valves, high-pressure flow meters, automatic gas analytical control devices, etc.

Methods of ammonia removal, liquefaction and water scrubbing have been tested and the efficiency of other absorbents measured.

Gas Purification for Direct Processes

The purification of the hydrogen and nitrogen employed in the synthesis is largely dependent upon the source of the hydrogen. This laboratory is investigating the various processes for the production of hydrogen, such as water gas, producer gas, electrolysis of water, etc., and also hydrogen as a byproduct of other industries. A survey of all possible sources of hydrogen is being made and tests of the feasibility of various new sources are under way.

An extensive investigation of the purification of the gases used in the process is also being conducted by the laboratory and suitable physical and chemical methods of purification have been developed for hydrogen from the usual sources. New methods are also being investigated. Since it is as important to prevent contamination of the gases during circulation as it is to supply pure gas to the system, means are being developed for eliminating oil lubrication.

Besides the problems mentioned above, which have a direct commercial bearing, the laboratory is determining some of the hitherto unknown theoretical data upon which the process is based. This work includes the accurate determination of ammonia equilibrium values at low temperature and high pressures, the solubility of nitrogen and hydrogen in liquid ammonia, the vapor pressure of ammonia in high-pressure systems and the behavior of gases under high pressure.

Cyanide Process Considered

While the laboratory has devoted much of its time to a study of the three commercially established processes for the fixation of nitrogen, it has made a survey of other fixation possibilities. There is an exceedingly large number of reactions by which nitrogen can be chemically fixed, but unfortunately those having an industrial significance in the present state of development of science and industry are rare indeed. The laboratory undertook a study of the more promising of these possibilities, such as formation of cyanides and various nitrides, and the researches are being continued.

Among these possibilities, the fixation of nitrogen as cyanide has received considerable attention. During the war the government constructed at Saltville, Va., a small plant to operate by this process to produce cyanide for poison gases, but it did not reach successful regular operation before the close of the war, when it was salvaged. The laboratory has made a complete study of the chemistry of the process and the work has suggested a number of improvements over the usual form of the process.

Cyanide can be treated to yield ammonia, which in turn can be converted into fertilizer salts, but the results of the laboratory study led to the conclusion that there is very little possibility at present of improving the process to the extent of making it an economical ammonia process. It does have a definite place, however, in the nitrogen industry in the production of higher priced nitrogen compounds, such as cyanides and hydrocyanic acid. A plant has recently been put into operation in California for the production of cyanide to be used as a source of hydrocyanic acid for fumigation of citrous fruits. It is interesting to note that more cyanide is now used in the United States for fumigation than for metallurgical purposes.

Of importance second only to the fixation of nitrogen itself is the conversion of the direct products first obtained into forms of agricultural, industrial and military value. For example, the direct product of the synthetic ammonia process is ammonia gas; that of the arc process liquid nitric acid. Both of these products must be converted into solid products for many purposes, and especially so for use as fertilizer. The conversion of ammonia nitrogen to nitrate nitrogen is likewise an important process, particularly from the military standpoint.

The laboratory has investigated a large number of these conversion processes and is in possession of much

valuable information in regard to them. They include the production of ammonium phosphate, ammoniated superphosphate, urea from ammonia and carbon dioxide and the oxidation of ammonia with special reference to the recovery of the oxides of nitrogen for direct conversion to nitric acid.

In connection with the production of ammonium phosphate a new process was developed which from the standpoint of simplicity and cost of installation is a decided improvement over existing processes. The work on the recovery of oxides of nitrogen and the direct production of concentrated acid will when fully developed mean an immense saving in the cost of producing synthetic nitric acid and nitrates.

The laboratory has developed methods of treating ammonium nitrate, an excellent synthetic fertilizer, to reduce its moisture-absorbing properties. These have included the graining and oil-coating of the nitrate and the production of various mixed salts with potash compounds.

The development of the nitrogen fixation industry in this country is making available to agriculture a whole new group of nitrogen materials. The Fixed Nitrogen Research Laboratory, in co-operation with the Bureau of Plant Industry, has made quite extensive field tests on these compounds—namely, cyanamide ammonium nitrate, ammonium phosphate, ammonium chloride, ammoniated superphosphate, and various double and mixed salts containing ammonium nitrate and urea.

The results of the activities of the Fixed Nitrogen Research Laboratory have been effective and far reaching and this in spite of the difficult nature of the problems involved. Some of the results of the laboratory's activities have already found practical application in the industry. It is obvious that not all of the work of this laboratory can be discussed, but enough of its work is here given to show the importance of and benefits derived from well directed scientific research. This is but another instance which demonstrates that any large industry must eventually rest upon the disclosures of scientific investigation. The work of the laboratory also gives us confidence that in the event of a national emergency, large plants could be erected with assurance of success.

A.S.M.E. Meeting of Interest to Chemical Engineers

Technical Papers on Heat Transfer, Coal Storage and Fluid Flow Prove of Much Worth, While Session on Hydro-Electric Power Is One No Engineer Could Afford to Ignore

EDITORIAL STAFF REPORT

Fred R. Low

THE annual meeting of the American Society of Mechanical Engineers was held in the Engineering Societies' Building, New York City, from Dec. 3 to 6. This meeting is always worth the attention of engineers in fields other than mechanical. Much of the material discussed is so fundamental as to have a bread and butter appeal to every engineer, no matter what his specialty. And, in addition, to be aware of progress in engineering in general helps the engineer keep his branch of engineering abreast of the times.

The meeting, attended by a representative gathering of the society's far-flung membership, opened with a general session, at which John L. Harrington, the president of the society for 1923, gave the annual presidential address, touching on the opportunity for greater service to the community by the engineer and the course to be followed in order that such service may be rendered. At this same session, Fred R. Low, the president-elect of the society, was introduced. Mr. Low, for many years editor of *Power* and an official of the A.S.M.E., is widely known for his work as chairman of the A.S.M.E. power test code committee and member of the boiler code committee.

Among the technical papers presented were some of primary interest to the chemical engineer. Foremost among these was one on "Heat Transfer for Water Flowing Inside Pipes," by Prof. W. H. McAdams and T. H. Frost of M.I.T. In all problems of heat transmission between water flowing inside pipes and any heating or cooling fluid outside, the heat flow is conditioned by three thermal resistances, that of the water film on the inner surface, that of the wall of the pipe and that of the external fluid film. The total or overall thermal resistance is, therefore, a complex variable, difficult to analyze; whereas the individual resistances involved are relatively simple. The authors, in this paper, report on research recently accomplished at M.I.T. which has resulted in the development of an equation that may be used by the designer of condensers or other similar heat transfer apparatus to predict the numerical value of the film coefficient of heat transfer between a clean pipe and the water which is flowing through it in turbulent motion. When used in connection with other data now available, this equation can be used to design the above-mentioned class of apparatus. It may also be used to predict the effect upon operating performance of changes in load or in conditions of inflow and outflow.

HYDRO-ELECTRIC DEVELOPMENT

The keynote session of the meeting was concerned with a topic of paramount interest to the general engineering world today: "The Fundamentals of Hydro-Electric Development." This topic was exhaustively covered by such well-known consulting engineers as John R. Freeman of Providence, R. I., and Colonel John P. Hogan, George A. Orrok and Harold W. Buck, all of New York City.

With the passage of the federal water-power act 3 years ago and the subsequent successful operation of the Federal Power Commission, 2,400,000 water horsepower has been built or is building. Applications have been made for the development of 21,500,000 hp. and licenses have been granted for 7,500,000 hp. When it is recalled that at the time the water-power act passed the hydro-electric power in the United States was 9,000,000 all told, it is easy to realize that we are in the

midst of a major engineering development which cannot fail to involve all branches of engineering in far reaching changes.

While the speakers recognized the necessity of developing this hydro-electric power as rapidly as conditions would warrant, to the end that waste of our coal resources might cease and industry might be decentralized, thus relieving the congestion of our cities, they cautioned that this development must be basically sound. The fundamental principles of hydro-electric development, each case of which must be studied individually, are first, that it must return a profit on its true cost to build and second, that it must be developed in such a manner as to contribute to public welfare in the highest degree.

In order that these fundamentals may be realized a thorough study must be made of each project before any development is commenced. This study must include the amount of water available on the stream, the location of the best possible dam site, the present and future power demand in the immediate vicinity, and the prospects for transmitting the excess power at reasonable cost to a good power market. Unless each of these factors, after thorough and scientific study, proves to be right, the development should not be made, but rather postponed to a more opportune time.

How Coal Should Be Stored

The session on fuels was mainly concerned with the storage of coal. Several papers of interest to all industries having coal storage problems were given. O. P. Hood, chief mechanical engineer of the Bureau of Mines, spoke on "Factors in the Spontaneous Combustion of Coal." After a discussion of the phenomena incidental to the self-heating of coal when subjected to change in environment and an analysis of the effect of the self-heating on the piling of coal, he summarized the fundamentals to be observed in storing coal with the minimum danger of spontaneous combustion as follows:

"There must be no heat added to the coal from outside sources, such as hot walls, steam pipes, oily waste, etc. If coal can be got into the pile in pieces that will stay on a ¾-in. bar screen, there will be no heating. The pile may be any height provided there be no fines. Where mixed lump and fine coal must be stored, the pile should be so built as to avoid segregation of sizes. The production of fresh surfaces by breakage just before going into storage predisposes to spontaneous combustion unless the crushing is so fine and the packing of the pile so dense as largely to exclude all possible air circulation.

"Coal should be so stored that its temperature conditions can be daily inspected. When any portion reaches a temperature of 140 or 150 deg. F., there is a high probability that within a few days or weeks a destructive temperature will be reached. If the temperature reaches 160 or 180 deg. F., there is almost a certainty that a destructive temperature will be reached. The best remedy is to move the warm coal so that it may cool.

"The possibility of quick removal should be considered in storing coal. This factor, rather than any tendency to heating, determines the desirable size of the pile and its height. The tendency to heat differs in different coals, and experience is so far the best guide in determining this difference."

A paper on coal storage systems was presented by H. E. Birch, of the R. H. Beaumont Co., and H. V. Coes, of Ford, Bacon & Davis. These authors take the same stand as did Mr. Hood on spontaneous combustion. They state that coal should be stored in such a manner that spontaneous combustion will be prevented and that the storage system should be selected so that it may be utilized easily and rapidly to fight any fire that may occur. After discussing in considerable detail the advantages and disadvantages of the various handling systems for getting coal into and out of storage, the following storage systems were discussed: railroad trestle, locomotive crane and trestle, locomotive crane and conveyor, storing and reclaiming conveyors, cable railway and electric cars, automatic railway, cable drag scraper, rope cableway, portable conveyors and belt conveyor stacker. From the findings of this discussion principles were laid down for determining the ideal storage plant. It must be of such design that it can be easily extended to take care of future requirements. It must meet the operating, maintenance and interest formula—that is to say, its actual cost per ton handled must be ascertained to be lower than that of competing systems. Boats or cars must be loaded and unloaded rapidly and economically. Storage should be such as to prevent spontaneous combustion. It must be able to reclaim coal economically and quickly and easily fight fire. It must be flexible enough so that it will not block the growth of the plant but can be easily moved to another location if that becomes necessary. And finally it must be so laid out as not to block any of the necessary plant traffic by its operations.

Flow of Fluids and Its Measurement

No branch of engineering practice is more fundamentally interested in the flow of fluids than is chemical engineering. Important papers on different phases of this unit process were included in the meeting. Prof. O. W. Boston, of the University of Michigan, read a paper on "Flow of Water in Short Pipes," in which a method of determining the frictional resistance to fluid flow in short pipes was given. This method consisted essentially in allowing a tank full of water to empty through the short pipe. In this way all velocities within the head range were made available in one test. The apparatus is simple and compact and offers a means of saving much time where tests in quantities are made for the purpose of comparative analysis.

Other interesting papers at the session on flow of fluids were: "The Gibson Method and Apparatus for Measuring the Flow of Water in Closed Conduits," by Norman R. Gibson, hydraulic engineer of the Niagara Falls Power Co., and "The Salt Velocity Method of Water Measurement," by Charles M. Allen and Edwin A. Taylor, both of Worcester Polytechnic Institute, Worcester, Mass. Each of these papers describes a newly developed method of measuring the velocity of flow and should prove of interest to all engineers engaged in such determinations.

In the course of the many other technical sessions, additional papers of interest to the chemical engineering industries were read. Among these were: "New Instruments for Physical Measurements," by Colonel W. H. Tschappat, U. S. A.; "Resistance of Various Aluminum Alloy to Salt Water Corrosion," by D. Basch and M. F. Sayre; "Corrosion, Cleansing and Protection of Aluminum," by Henry A. Gardner.

New Light on the Combustibility of Coke

A Discussion of the Experimental Work on Coke Recently Carried Out at the Bureau of Mines for the Purpose of Determining the Relation of Its Physical Properties and Combustibility to Its Production and Use

BY A. C. FIELDNER
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THERE is perhaps no phase of fuel technology that has aroused more discussion or regarding which there is more difference of opinion than the properties of coke which make it most suitable for blast-furnace and other uses. The older textbooks, the authors of which were less hampered by experimental evidence, had much more positive opinions on the subject than the books of today. The older specifications insisted on large, massive pieces of silvery luster and metallic ring with as low as possible content of moisture, ash, sulphur and volatile matter. The first by-product coke was rejected without trial by the blast-furnace man because it was smaller and lacked the much prized silvery luster and metallic ring. Today the furnace man who must use beehive coke considers himself handicapped in making good consumption and capacity records. Experience has shown that the greater uniformity in size and quality of byproduct coke far outweighs the esthetic considerations that favored the use of beehive coke.

The metallurgical industry now realizes that practically nothing is known regarding the optimum physical properties of metallurgical coke and that reliable information on this subject is needed from a number of viewpoints. The furnace man should be able to specify the kind of coke that is best for his purpose without imposing any needless requirements that reduce the oven output and sacrifice a portion of the gas and by-product yield. It is probable that many coals now thought to be inferior for production of suitable metallurgical coke can be used when we have a real knowledge of the relation of the properties of coke to its performance in use. Excellent records have been made in the last 2 years in a furnace using coke of inferior physical properties when judged by usual standards, made from Illinois coal. These are the reasons for the Bureau of Mines taking up a fundamental investigation of the properties of coke and the influence of these properties on blast-furnace reactions and operation.

The first step in this research was the standardization of the methods of testing. This was done in co-operation with committee D-5 on coal and coke of the American Society for Testing Materials. The methods for chemical analysis had previously been standardized and were generally recognized as satisfactory, but there were no generally recognized standards for judging the physical properties.

Depending on the method of carbonization and the selection of the coal, coke may vary widely in its physical properties. It may be light or heavy, porous or dense, soft or hard, brittle or tough, weak and friable or strong and coherent. The pieces may vary in shape and structure from large, massive, blocky pieces to small, fingery pieces full of checks. It may ignite easily or with difficulty, and it is believed by many that the reactivity with oxygen and carbon dioxide varies greatly in different cokes—that is, some coke has greater combustibility or burns faster than other cokes. Many of these physical properties are so interrelated that it is exceedingly difficult to devise tests for their separate evaluation. And even in such cases where tests have been devised, their meaning in terms of operation is obscure. The work of standardization was therefore doubly difficult because of doubt as to the interpretation and value of the results in practical use.

The first step in this investigation was to study and standardize, if possible, the physical tests in most common use. These are the shatter test for determining the resistance of coke to breakage on handling; the tumbler or "hardness test" designed to give a relative value for the resistance of coke to mechanical attrition in the furnace; true and apparent specific gravity from which the porosity or per cent cell space may be computed; combustibility, or rate of oxidation in air, and the so-called "solubility in carbon dioxide," or rate or reaction with carbon dioxide. The last two tests are chemical rather than physical.

No particular difficulties were involved in working out procedures for reproducible determinations of the true and apparent specific gravity from which the porosity or per cent cells of the coke can be readily computed. Careful consideration was given to the procuring of representative samples of considerable size, a matter of importance because of the great variation in porosity of coke from different parts of the oven. The work on specific gravity and porosity was done at the Pittsburgh Experiment Station and the results obtained were published in a paper by Selvig and Parker. (Selvig, W. A., and Parker, W. L., "Determination of Specific Gravity of Coke," *Chem. & Met.*, 1923, vol. 28, p. 547.)

Paper read at the winter meeting of the A.I.C.E., Washington, D. C., Dec. 5 to 8, 1923. Published by permission of the Director, Bureau of Mines, Department of the Interior.

The shatter and tumbler or "hardness" tests were studied at the Southern Experiment Station of the Bureau of Mines at Tuscaloosa, Ala., by Kinney and Perrott, who made many tests on a wide variety of coke, giving particular attention to the size and selection of the samples for test, the methods of screening and the agreement of results of duplicate determinations. These results are given in a paper in *Industrial and Engineering Chemistry*, vol. 14, pp. 926-41.

Shatter Test—In the shatter test a 50-lb. sample of coke was dropped four times from a height of 6 ft. upon a steel or cast-iron plate. The material was then screened over a 2-in. square mesh screen, and the percentage of the original sample remaining on the screen was reported as the shatter test result. Critical study of this procedure with many samples showed that (1) a 50-lb. sample of coke is too small to be representative and the variation of different pieces of coke is so great that at least three and preferably five tests should be averaged; (2) large pieces of coke about half the width of the oven gave the most uniform and reproducible results; (3) more reproducible values were obtained in screening the coke after the shatter test by putting all the pieces through the screen which would go

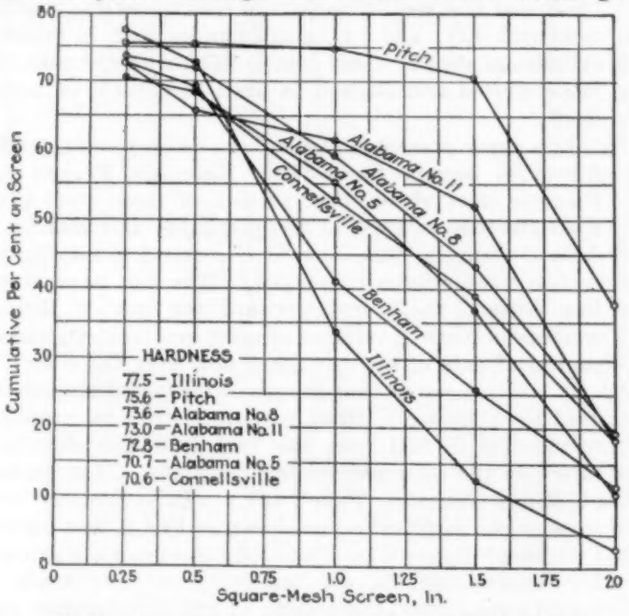

Fig. 1—Comparisons of Screen Analyses of Cokes After Tumbler Barrel Test

through in any position than by shaking the screen; (4) the use of a series of screens—namely, 2 in., 1½ in., 1 in. and ½ in.—gives a much better indication of the resistance of the coke to shattering than the single 2-in. screen now in use.

Tumbler or "Hardness" Test—A 25-lb. sample of 3- to 2-in. coke was placed in the apparatus and the drum revolved 1,200 times at the rate of 20 r.p.m. The so-called "hardness" number is the percentage of original sample remaining on a ¼-in. screen. Some blast-furnace men think this test is a measure of the relative resistance of cokes to mechanical attrition in the blast furnace. Perrott and Kinney's work showed that this test as made in a 30-in. diameter drum was influenced by two principal factors, in determining the amount of coke broken to pass a 0.25-in. screen—namely, impact and abrasion. Tests made with a sample of 3-in. lumps produced more fines than tests with samples of 1-in. lumps, due presumably to lesser crushing effect of small lumps from the top of the drum upon the material near the bottom.

This analysis led to the further conclusion that a coke which shattered easily was broken up early in the test period to small pieces which had a relatively small crushing effect on dropping across the revolving drum and thus producing little fines from impact. This action evidently took place in the tests with Illinois, Benham and Alabama No. 6 cokes as shown in Table I; these cokes gave very low shatter tests, but high hardness numbers. Further inspection of Table I shows that some cokes with high shatter test figures show hardness numbers equally high to cokes of low shatter

TABLE I—PHYSICAL PROPERTIES OF COKE SAMPLES

Coke	Shatter	Hardness *A*	Hardness *B*	Specific Gravity True	Specific Gravity Apparent	Porosity
Alabama No. 1	70	70	....	1.75	.96	45
Alabama No. 2	74	73	89.1	2.10	1.02	52
Alabama No. 3	69	68	89.4	1.96	1.00	49
Alabama No. 4	72	67	....	1.91	.83	57
Alabama No. 5	69	71	90.6	2.00	.99	51
Alabama No. 6	64	74	90.2	2.13	1.15	46
Alabama No. 7	72	71	88.8	1.91	.98	49
Alabama No. 8	70	74	90.4	1.98	1.05	47
Alabama No. 9	70	74	92.3	2.04	1.14	44
Alabama No. 10	70	68	....	1.92	.98	49
Alabama No. 11	77	73	....	1.97	.81	59
Benham	59	73	88.4	1.85	.91	51
Connellsville	66	71	92.0	1.89	1.02	46
Illinois	42	78	90.5	1.84	.87	53
Pitch coke	78	76	92.9	2.00	1.16	42

A Method using 3-2 in. coke; result reported as percentage remaining on a ½-in. screen.

B Method using ¾-½-in. coke; result reported as percentage remaining on a ¼-in. screen.

test. Evidently the hardness test as now practiced measures an uncertain combination of impact and abrasion.

In Fig. 1 are plotted the screen analyses of seven cokes after passing through the tumbler test. The entire range of the hardness figures for these cokes is from 70.6 to 77.5 per cent, a total range of 7 in a value the probable error of a single determination of which is approximately 1. Fig. 1 also shows that the hardness values of these cokes is quite different in the larger sizes. If we take the per cent on ¼-in. screen as our criterion of "hardness," then the Illinois coke is the hardest, since 77.5 per cent remains on this screen, as compared with 70.6 per cent for Connellsville beehive coke.

On visual inspection the blast-furnace superintendent would say that the Connellsville coke was incomparably harder than the Illinois coke. However, referring again to Fig. 1, we see that only 15 per cent of the Illinois coke passed over the 1½-in. screen, as compared with 38 per cent for the Connellsville coke and 70 per cent for the pitch coke. The amount of ¼- and ½-in. material produced does not vary much for widely different cokes, but the percentage of material on the 1-in. and the 1½-in. screens does vary greatly and in the same order as the shatter test values. With such additional screening the tumbler test becomes of some value, but does not give any new or additional information on physical properties not shown by the ordinary shatter test.

To eliminate the effect of impact, Perrott and Kinney modified the tumbler test by first crushing the coke sample to pass through a ¾-in. screen and remain on a ½-in. screen. The hardness number was the percentage remaining on a ¼-in. screen. The results, which are given in Table I, vary from 88.4 per cent for Benham coke to 92.9 per cent for pitch coke, a total range of 4.5 units. Evidently the resistance to attrition of small pieces of coke rolling on one another and dropping

through a distance of 30 in. is very similar for all coke, and probably of much less significance in the use of coke in furnaces than is the breakage of the larger pieces.

While the previously described research work on the tests for physical properties of coke was in progress at the Pittsburgh and Southern Experiment Stations of the bureau, P. H. Royster and T. L. Joseph, metallurgists at the North Central Experiment Station, Minneapolis, Minn., were studying blast-furnace reactions in miniature furnaces at this station and in commercial furnaces whenever opportunity offered. They suggest that so little was known of the mechanism of the processes inside the blast furnace that the furnace operator could not know what physical properties to specify even if we worked out a complete system for their evaluation. Several weeks were spent interviewing coke-oven and blast-furnace operators in the Birmingham, Pittsburgh and Chicago districts and it was apparent that neither the furnace man nor the coke-oven operator knew the optimum physical and chemical properties of blast-furnace coke in quantitative scientific terms. According to their best opinions, a good blast-furnace coke (1) must have sufficient mechanical strength to resist crushing and abrasion in the furnace; (2) must be low in ash and sulphur; (3) must be of uniform size; (4) must be resistant to the oxidizing action of the carbon dioxide in the stack gases; and (5) must burn very rapidly at the tuyeres. There is much discussion in the literature along these lines, but no definite quantitative experimental data, and indeed it is very difficult to get such data.

At the present time most blast-furnace men believe that cokes vary in combustibility and that such variations have an important influence on output and the amount of coke required to produce a ton of iron. The definitions of combustibility vary from "that variable property of cokes by virtue of which it is possible to maintain a higher tonnage and produce a ton of iron with a smaller amount of one coke than of another" to "the speed at which the carbon molecules in the coke combine with oxygen under given conditions."

Likewise, different "combustibility" tests are in use—namely: (*a*) a laboratory tube test, in which a weighed amount of pulverized coke is heated to a definite temperature in a current of air or oxygen for a definite time, and the loss in weight is considered the relative combustibility; and (*b*) a salamander test, in which a cylindrical shell of sheet iron is filled with the coke, the mass ignited and allowed to burn in natural or forced draft.

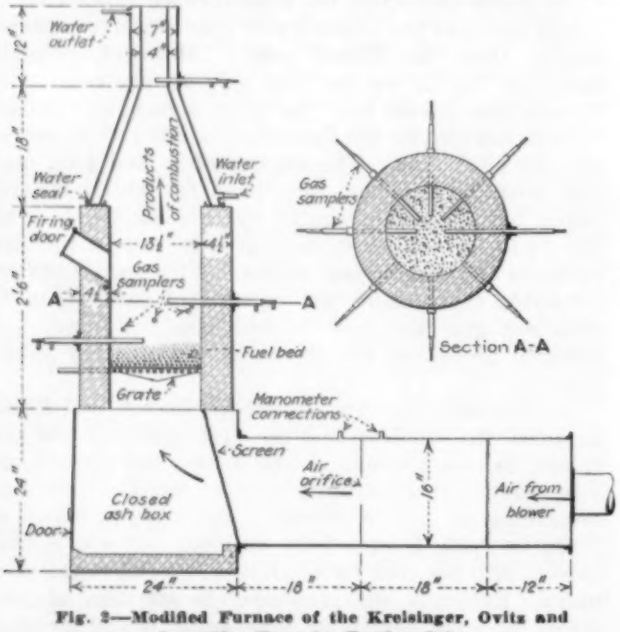

Fig. 2—Modified Furnace of the Kreisinger, Ovitz and Augustine Type for Testing Coke

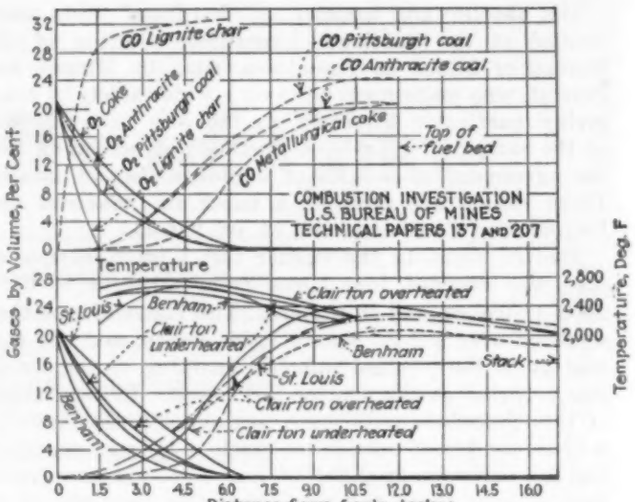

Fig. 3—Mean O_2 and CO Content of Gases and Temperatures in Fuel Bed of Various Tests With the Kreisinger Furnace

In a paper presented at the June, 1923, meeting of the American Society for Testing Materials, Perrott and Fieldner have shown that neither of these tests gives a satisfactory measure of combustibility as scientifically defined—namely, "the rate of the chemical reaction of carbon combining with oxygen." The two large errors that vitiated both methods are the use of definite weights in place of volumes of coke, and lack of accurate control of rate of air or oxygen flow over the coke.

It was suggested that the small furnace designed and used by Kreisinger, Ovitz and Augustine for studying combustion in fuel beds was free from the objections raised to the tube and salamander tests. (See Bureau of Mines Technical Paper 137.) This furnace, with some slight modification as shown in Fig. 2, was used at Pittsburgh Experiment Station by Sherman and Blizard for determining the combustibility of four kinds of blast-furnace coke, the results of the investigation and full description of the apparatus being reported at the February meeting of the A.I.M.E. in New York. Further tests have been made on the effect of size, and on petroleum coke, pitch coke and lignite char. A part of these latter tests are reported by Sherman and Kinney in *Iron Age*, June 28, 1923, pp. 1839-44.

Combustibility by the Kreisinger Furnace

A brief summary of the work with this furnace will be of interest. It has a grate area of 1 sq.ft., is mounted on a wind box so that the rate of air supply can be accurately measured and controlled, and is provided with radial holes around the side of the furnace through which gas samples are taken with water-cooled tubes and through which temperatures are read with an optical pyrometer.

The cokes for test were carefully sized, the depth of the fuel bed and the rate of air supply were maintained constant for all similar tests. Fresh charges of fuel and removal of ash were made in small increments so as to keep the fuel bed at a constant level. Numerous

gas samples were taken at intervals of 1½ in. from the grate. The average results of these analyses are shown in the lower half of Fig. 3. The cokes were burned at approximately 25 lb. per sq.ft. per hour, sized to between 1½ and 1 in. The upper half of Fig. 2 gives results of some earlier tests by Kreisinger on different fuels.

It will be observed that in no test was the combustion fast enough to proceed to complete reduction to carbon monoxide within the space of the 12-in. fuel bed used in all the tests. The relative combustibility of the coke, therefore, cannot be measured by the extent of the combustion zone as in the blast-furnace hearth. However, the relative combustibility as regards oxygen may be measured by the distance above the grate where oxygen is completely consumed, or, for the entire 12-in. fuel bed, by the percentage of carbon monoxide in the gases leaving the fuel bed. In the blast-furnace combustion zone we are concerned with complete conversion of solid to gaseous carbon, the end product being carbon

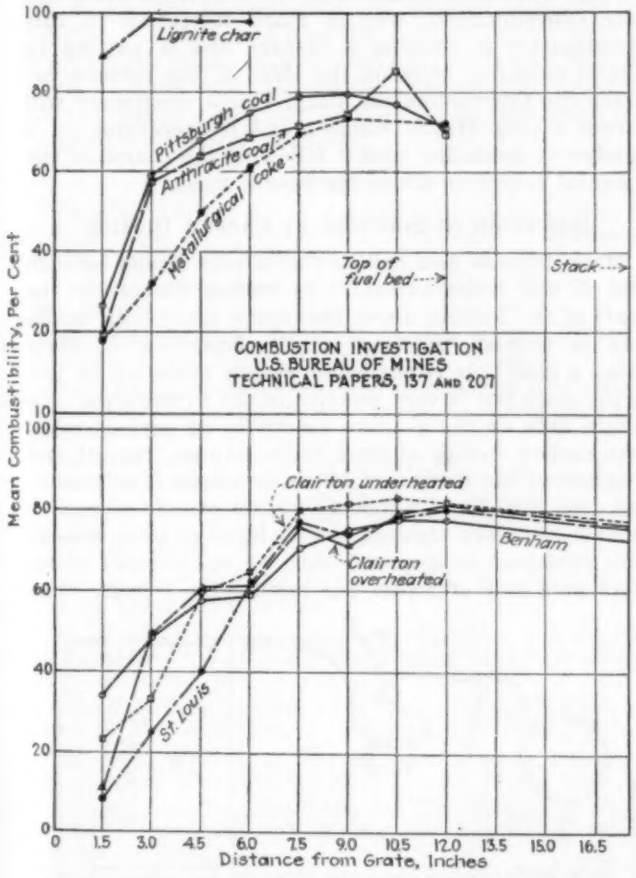

Fig. 4—Mean Combustibility of Various Fuels at Varying Distances From the Grate

monoxide. From this standpoint the percentage completeness of combustion at any point is represented by the following expression: $CO_2 + CO \div 2CO_2 + CO + 2O_2$, since a gas containing $xCO_2 + yCO + zO_2$ will give on complete reaction with carbon at blast-furnace temperatures $2xCO + yCO + 2zCO$. We, therefore, may express the relative combustibility of the fuels at any point of the fuel bed in terms of completeness of combustion, by substituting the gas analysis from that point in the above expression.

Fig. 4 shows the mean combustibility in per cent completeness of combustion of various fuels at varying distances from the grate. The curves show that near

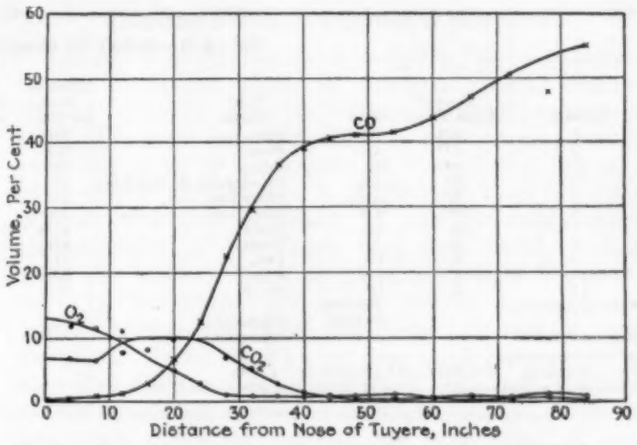

Fig. 5—Combustion of Coke in Blast-Furnace Hearth, Made by Averaging Data From Ten Furnaces

the grate, where the principal reaction is $C + O_2 = CO_2$, the combustibility varies with the different cokes, but that about 6 in. above the grate it is about the same, 60 to 65 per cent; between this point and the top of the fuel bed the curves again separate somewhat, but approach to within a range of approximately 5 per cent at the top of the fuel bed. It should be noted that the cokes do not show the same order of combustibility in oxygen as they do in carbon dioxide; however, the tests are, as yet, too few in number to explain these differences or to draw any general conclusions as to the effect of ash content, porosity, time of coking, etc.

The size of the fuel does have a marked influence and the high combustibility of the lignite char is largely due to the fact that it would all pass through a ½-in. screen, whereas the cokes were from 1 to 1½ in. in size. In future tests more attention must be given to size. Tests are now in progress with pitch coke, petroleum coke and a number of varieties of beehive and byproduct cokes. The experimental difficulties are great. From the limited data now at hand it appears that the size of the coke is likely to prove a much greater factor in determining the extent of the combustion zone in a blast furnace than the porosity, condition of coking or kind of coal, except as these factors influence the size of the coke when it reaches the tuyere zone.

Extent of Combustion in Blast Furnace

The problem was attacked from another angle by Perrott and Kinney at the Southern Experiment Station of the bureau in the Birmingham, Ala., district. Their method consisted in taking hearth gas samples at intervals of 4 to 6 in. on a line from the tuyere nose to the center of the furnace through water-cooled sample tubes inserted in the tuyeres. The co-operation of blast-furnace operators was obtained and experiments were completed at six blast furnaces in the Birmingham district, six in the northern district at Pittsburgh, Pa., Youngstown and Columbus, Ohio, and at East St. Louis, Ill. Also one test was recently made at a charcoal furnace.

Fig. 5 shows the average gas analyses from ten furnaces. The separate plots for each furnace are not reproduced here, but were given with complete details of the first part of this work in Perrott and Kinney's paper before the February meeting of the A.I.M.E. in New York. There was but little difference in the curves for the different furnaces even when the coke was quite different in composition. Fig. 5 shows that combus-

TABLE II—RELATIVE REACTIVITY OF COKES WITH CO_2

Furnace	Type of Coke Oven	Coal State	Coal Seam	Tons of Iron per Day	Coke per Ton of Iron	Carbon Burned at Tuyeres per 100 Lb. Carbon Charged as Coke	Density of Coke True	Density of Coke Apparent	Porosity	Loss by CO_2 on Standard Test Grams	Loss by CO_2 on Standard Test Relative
1	BH	Pa.	Pgh.	220	2,800	75	1.89	1.02	46	0.7	10
2	BH	Ala.	Pratt	322	2,807	76.5	2.13	1.15	46	0.9	13
3	BH	Pa.	Pgh.	580	1,960	77	1.90	0.98	48	0.9	13
4	SS	Ala.	Brookwood & Meldale	258	3,160	78	2.00	0.99	51	1.1	16
5	SS	Ala.	Mary Lee	260	2,800	72	1.96	1.00	49	1.1	16
6	SS	Ala.	Mary Lee	356	3,345	77	1.92	1.05	45	1.1	16
7	K	Ala.	Pratt	418a	1,900	78	2.04	1.14	44	1.2	17
8	K	Ala.	Pratt	476	2,750	78	2.01	1.13	44	1.2	17
9	K	Pa.	Pgh.	512	1,960	76	1.90	0.98	48	1.3	19
10	K	Pa.	Pgh.	525	2,100	78	1.99	1.04	48	1.5	21
11	R	Ill.	No. 7	515	1,770	73	1.84	0.87	53	3.0	43
Charcoal furnace b		Herrang, Sweden	Charcoal c	....	1,600	79	....	....	..	7.0c	100
Charcoal furnace		Ala.	Charcoal c	50	2,080	78	....	....	..	7.0	100

a 45 per cent scrap.
b From Richards, "Metallurgical Calculations," p. 246.
c Average of several samples of wood charcoal made in the U. S. A.

tion in the hearth is very rapid, the oxygen diminishing to practically zero at 24 to 30 in. from the tuyeres, while carbon dioxide disappears at 32 to 40 in. The oxygen of the blast has completed its work of gasifying carbon at about 36 in. from the tuyeres, and the combustion zone occupies about 200 cu.ft., or but 1 per cent of the furnace volume.

They found that differences in the extent of the combustion zone at the several furnaces were a matter of inches only, and bore no apparent relation to the composition or physical structure of the coke. Contrary to the general opinion of blast-furnace men, this investigation showed that the combustion zones of furnaces operating on low coke per ton of iron were approximately the same size as of those furnaces operating on high coke composition. The differences observed in the individual gas analyses of the various furnaces were too small and irregular to correlate with any known change in chemical composition or physical structure of the coke. The results of this investigation confirm the tentative conclusions from the combustibility tests in the Kreisinger furnace—namely, that the rate of combustion of all kinds of coke in the tuyere zone of the blast furnace is so nearly the same that it has no appreciable influence on the furnace economy or operation.

Blast-furnace men do not accept these conclusions yet and have suggested further work to secure confirmatory evidence; this is now being done by Mr. Kinney in the Birmingham district, where a blast-furnace superintendent who is much interested in this investigation is relining a furnace and is putting in special sampling holes on the sides of the furnace between the tuyeres and the stack. This arrangement will permit taking of gas samples and temperatures on a number of levels and permit following the course of the chemical reactions above the hearth zone.

Oxidation or Solution by Carbon Dioxide

Many furnace men believe that a coke should be such that it will resist oxidation by carbon dioxide in the shaft of the furnace above the tuyere zone; such oxidation is termed "solution loss." According to their ideas, a good coke is one which resists oxidation by CO_2 in the stack but is very reactive in the tuyere zone. To obtain data on the relative reactivity of various cokes with carbon dioxide at stack temperatures, Perrott and Fieldner of the Bureau of Mines developed a laboratory test (see Fig. 6) in which a constant stream of carbon dioxide is passed through a 2-in. layer of 6- to 8-mesh coke contained in a quartz tube (1 in. internal diameter) at a rate of 1 liter per minute for 1 hour. The

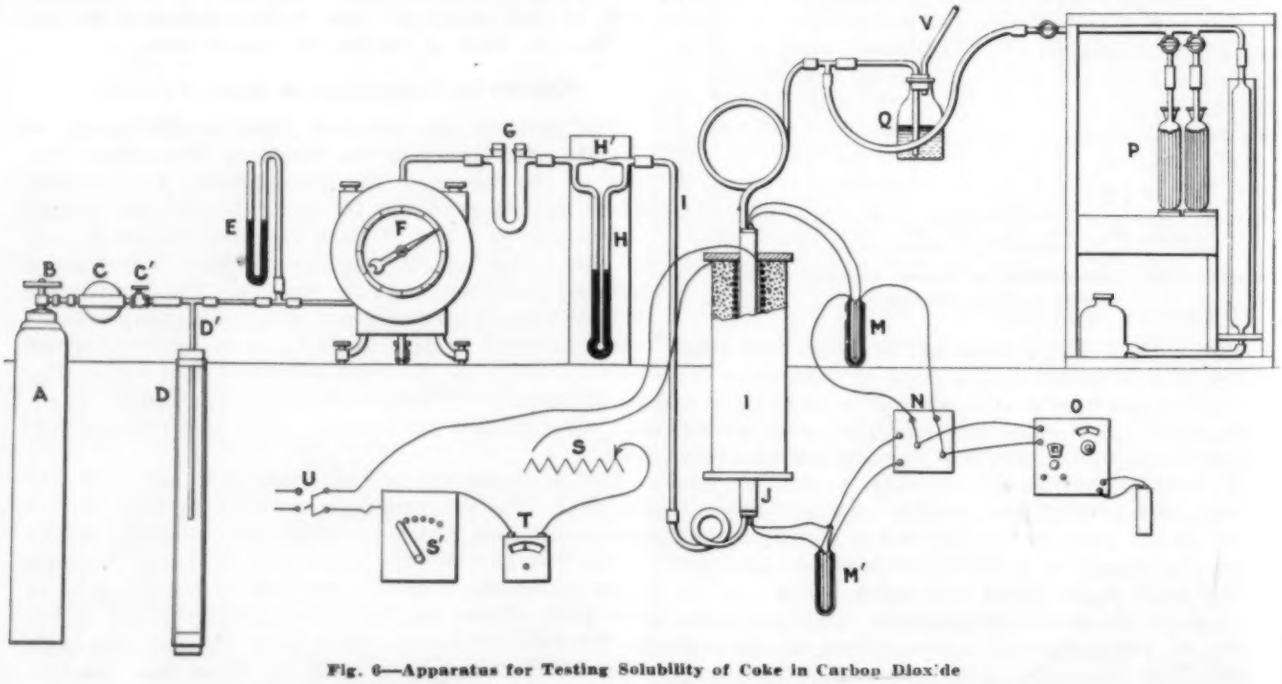

Fig. 6—Apparatus for Testing Solubility of Coke in Carbon Dioxide

temperature of the coke is maintained at 1,000 deg. C. throughout the test. The result is reported as grams of carbon oxidized during the test.

A comparison of the test results with actual operating data is shown in Table II. In this test we find a considerable difference in the reactivity of the cokes to carbon dioxide at 1,000 deg. C., but unfortunately it shows no definite relation to the percentage of carbon oxidized above the tuyeres, as calculated from the operating data of the furnaces using these cokes. Charcoal, for example, shows a weight loss by the laboratory test of 100 times that of Connellsville coke, but shows a slightly greater percentage of its total carbon burned at the tuyeres than Connellsville coke. Here again the expectations and beliefs of the blast-furnace operator are not realized. He, however, retains his belief that combustibility, reactivity with CO_2, porosity, nature of the carbonaceous material, volatile matter, etc., are of prime importance in coke and insists that the coke producer shall run his ovens regardless of the byproduct yield to the single end of producing the kind of coke that he believes is needed, and to prove his point he is inviting the bureau's research men into his plants and offering every co-operation. He realizes, however, the further need of chemical engineering research on the mechanism of the blast-furnace reactions.

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Coalite Process Proves a Success

According to *Chemistry & Industry*, the well-known British "Coalite" plant at Barugh, near Barnsley, which has been in practically continuous operation since the latter part of 1921, is now to be greatly extended so as to be capable of carbonizing 500 tons of coal per 24 hours. It is claimed that the very difficult practical problems of the low-temperature carbonization of coal have now been finally solved with the present form of plant, but Low Temperature Carbonisation, Ltd., has desired to give the matter a thorough large-scale practical test of long duration. Hence the 2 years' run, and it may be stated also that the plant in operation at Barnsley has been visited by a large number of chemists, fuel technologists, engineers and other experts, not only from all over Great Britain but also from foreign countries as well. The results are stated to have been so successful that the present great extensions are now to be proceeded with immediately, and it is also the intention to erect similar 500-ton plants in different industrial centers so as to supply the local demand for smokeless fuel, motor spirit, liquid fuel and sulphate of ammonia. As will be remembered, the Coalite process consists in the direct carbonization of coal, without any preliminary treatment or subsequent briquetting, at 1,000 deg. F., and that the yield from 1 ton of ordinary average semi-bituminous coal, with 25 to 30 per cent volatile matter, is 4,500 to 6,000 cu.ft. of very rich gas (700 to 825 B.t.u.), 18 to 20 gal. of valuable paraffinoid low-temperature oils, 15 lb. of sulphate of ammonia, and 14 cwt. of residual smokeless Coalite containing 10 per cent volatile matter.

Of course the yield differs, depending on the coal, and some recent lengthy experiments, for example, carried out over many months showed that 8,280 tons of coal gave a yield of 6,210 tons of smokeless Coalite, 172,565 gal. of tar oils, and more than 38,000,000 cu.ft. of rich gas, more than 800 B.t.u.

The work that has been involved in this achievement is almost incredible, dating back to Parker's first experiments at Wednesfield, near Wolverhampton, in 1901, and the total cost is stated to have been more than £1,000,000, while the amount of coal carbonized is more than 100,000 tons. The chief trouble, of course, is one of price, and especially the value to be placed on the Coalite. It is agreed that a smokeless fuel of this nature burns in an open grate with a very high radiant efficiency, something like 30 to 35 per cent as against 20 per cent for coal, but it is obvious the householder will never pay anything like its true value. However, it is stated that Coalite can be put on the market at the same price as raw coal and still leave a reasonable margin.

To Test Hardness of Porcelain

The Ceramic Division of the Bureau of Standards is developing a hardness test for porcelain glazes which consists essentially in wearing away the glaze by means of a standard sand which is allowed to run through an orifice of known dimensions and to strike upon the inclined surface of the specimen after falling a predetermined distance. Satisfactory results are being obtained in comparatively short intervals of time and with small amounts of sand, both being well within practical limitations. A circular letter has been sent to a considerable number of potters asking that samples be submitted for testing.

Calcium Arsenate Made With Chlorine as the Oxidizing Agent

To Dispense With a Cumbersome Nitric Acid Recovery System and at the Same Time to Utilize What Is Now an Industrial By-product, Chlorine, Should Make This Process Worth Investigating

BY M. N. AND P. N. DVORNIKOFF
Consulting Chemists, New York City

THE process of manufacturing calcium arsenate, an insecticide for which there is a steady and rapidly growing demand, involves an important and difficult step of oxidation of arsenious acid into arsenic acid. At present nitric acid is being widely used as oxidizer in spite of many disadvantages connected with such method, which requires an elaborate plant for recovering the oxides of nitrogen and furthermore is always accompanied by an appreciable loss in nitric acid. On the other hand, the tremendous and still expanding electrolytic production of caustic alkalis has in the past few years resulted in an overproduction of chlorine, thus bringing up an attractive but little investigated possibility of utilizing chlorine in the oxidation of arsenious acid. In the first attempt to use chlorine for this purpose it was proposed to treat white arsenic suspended in water by passing a current of chlorine through the liquid; this first attempt is dated some years back, and was later replaced by the nitric acid method.

Some people scoff at analytical chemistry! Here is an article dealing with some reactions that are standard analytical reactions and yet they have considerable industrial possibility. Perhaps Mr. Æsop would at once develop a slogan, "Back to the analytical textbooks!" Still there is food for thought.

A recent United States patent, No. 1,415,323, granted to Carleton Ellis and Vernon T. Stewart on May 21, 1921, and supplemented on March 6, 1923, by No. 1,447,937, has also apparently failed to find an extensive practical application. The main difficulties of oxidizing arsenious acid with chlorine are outlined below.

Arsenic trioxide and chlorine may be assumed to react as follows:

$$As_2O_3 + 2Cl_2 + 2H_2O \rightleftarrows As_2O_5 + 4HCl$$

The above equation represents a practical chemical equilibrium. The existence of a clearly defined chemical equilibrium also finds confirmation in the well-known fact that the reaction of arsenic acid with either hydrogen sulphide or sulphur dioxide in presence of concentrated hydrochloric acid results in its complete and rapid reduction to arsenious compound. Therefore it is safe to say *a priori* that the removal of the hydrochloric acid from the reaction zone will shift to the right the above equilibrium, thus accelerating the reaction as well as making the process of oxidation more satisfactory and complete. Experimental data seem to confirm these deductions.

Apparently, in the above-mentioned patents the treatment of suspended arsenious acid with a current of chlorine diluted air is suggested in order to secure the described improvement in the process. If this method of direct use of free chlorine has apparently failed to be commercialized, the failure may be attributed to the poor absorption of chlorine or perhaps to the volatilization of arsenic as arsenious trichloride. (See B. J. Smart and J. T. Philpot, *J. Soc. Chem. Ind.*, London, 1914, vol. 33, p. 900.) Guided by the necessity of having a low degree of concentration of hydrochloric acid in the solution in order to assure a more complete and satisfactory reaction, we have conducted a series of experiments wherein at first chloride of lime was used instead of chlorine. In this case the reaction also takes place in an acid solution:

$$As_2O_3 + Ca(ClO_2) = As_2O_5 + CaCl_2$$

but, of course, the concentration of H ions is much lower. Furthermore, and this is a valuable technical improvement, open vessels may be used instead of closed, since the danger of arsenious trichloride polluting the atmosphere is reduced to a minimum. The reaction flows rapidly and easily in a warmed-up solution of bleaching powder and white arsenic in suspension, to which mixture lime is added later on; the resulting compound, calcium arsenate, is free from arsenious acid.

If an unfiltered solution of bleaching powder is used instead of filtered, it is possible to utilize that part of active chlorine which otherwise is very difficult to obtain in a soluble form. As mentioned before, the substitution of free chlorine with bleaching powder has resulted in a lower acid concentration, which insures a more complete and satisfactory reaction. It can be stated *a priori* that still better results may be obtained should the hydrogen ions in the solution be entirely dispensed with through the neutralization of the acid. In this form, with no free hydrogen ions present, the reaction becomes quantitative, and is complete to such an extent that it has found for itself a place in the analytical chemistry, where, for instance, the quantity of active chlorine in bleaching powder is readily ascertained by titration with a standard solution of arsenious acid and sodium bicarbonate (Penot method). Even should chlorine be replaced with iodine, which is a much weaker oxidizer, the reaction would still retain its quantitative character.

In the absence of hydrogen ions calcium arsenate could, for instance, be obtained by the following method, which may be considered as a practical variation of those used in analytical chemistry: Arsenious acid is dissolved in a solution of sodium hydroxide, to which

a solution of bleaching powder and calcium chloride is then added; of course, in this case the reaction is also quantitative:

$$6NaOH + As_2O_3 = 2Na_3AsO_3 + 3H_2O$$
$$2Na_3AsO_3 + Ca(ClO)_2 + 2CaCl_2 = Ca_3(AsO_4)_2 + 6NaCl.$$

It is not essential to dissolve caustic soda, since the requisite solution (2 to 3*N*) may be readily formed by boiling a solution of sodium carbonate with calcium hydroxide. Calcium arsenate obtained by this method is of superior quality, being free from impurities usually contained in lime; however, the process is handicapped commercially to a great extent on account of the loss in caustic alkali.

A loss in alkali is also characteristic of the methods suggested by E. O. Barstow. (See U. S. Pats. 1,169,114, 1,184,693 and 1,184,694, all issued in 1916.) While his patents, dealing primarily with the manufacturing of lead arsenate, contain some exceptionally broad claims, the description of production methods pertaining to insoluble metallic arsenates other than lead is very vague, and all particulars are in fact limited to a mere enumeration of the necessary ingredients. Analogy of lead arsenate to other arsenates, such as calcium, may exist only to a certain degree, on account, to quote as one instance, of wide divergence in the solubility of $PbHAsO_4$ or $PbCl_2$ and corresponding calcium compounds.

Furthermore, describing the oxidation of arsenious acid in an alkaline solution, E. O. Barstow at the same time suggests a variation, wherein arsenious acid is oxidized before the addition of alkali, failing to point out the distinct advantage of the first process as compared to the second.

The New Method

After a search for a more profitable method, where calcium arsenate would still be obtained in an alkaline solution, it appeared advisable to alter the usual procedure and first to obtain calcium arsenite, subsequently oxidizing it into arsenate, which readily takes place. The drawback of this method is in the small velocity of solution of arsenious acid; however, this solution can be considerably accelerated by transforming the standard crystalline form of white arsenic into amorphous, the solubility of which is both higher and more rapid. (The description of this transformation process may be found, for example, in the German patent No. 159,541, granted to Souhem in 1903.) Satisfactory results are also obtained by boiling the solution under pressure, when water may be made to dissolve its own weight of arsenious acid. (See Bloxam, "Inorganic and Organic Chemistry, 1923, p. 216.) On the other hand, it is generally known that the process of dissolving arsenious acid in water may be substantially accelerated in presence of a suitable catalyst. According to K. Drucker (*Z. phys. Chem.*, vol. 36, pp. 173, 693), both hydrogen and hydroxyl ions produce a strong catalytic effect upon the velocity of solution of arsenious acid in water. And our experiments have provided convincing data that at boiling point the velocity of solution in presence of a nominal quantity of NaOH is sufficiently high to meet all the usual technical requirements.

Other Methods of Producing Calcium Arsenite

Calcium arsenite can also be obtained directly by boiling milk of lime with arsenious acid in suspension. Proper heating of a solution of bleaching powder, containing both lime and arsenious acid, has also given satisfactory results. However, it should be noted that both these methods require a very careful and close chemical control.

There is another method of producing calcium arsenite, wherein the difficulty of dissolving arsenious acid is obviated. As_2O_3 is dissolved in a solution of NaOH, treated with lime and boiled, leaving calcium arsenite as precipitate in a solution of recovered sodium hydroxide, which, of course, is again used for dissolving As_2O_3.

$$As_2O_3 + 6NaOH = 2Na_3AsO_3 + 3H_2O$$
$$2Na_3AsO_3 + 3Ca(OH)_2 = Ca_3(AsO_3)_2 + 6NaOH$$

Still another method of procuring calcium arsenite consists of using ammonia as solvent.

Of course, in both cases the quantity of sodium hydroxide and ammonia respectively need be only a small percentage of the theoretical figure quoted in the above equations.

As an oxidizer of arsenious acid, bleaching powder may be substituted with chlorine, provided lime is present in the place of reaction; thus, for example, calcium arsenite can be oxidized into arsenate by passing a current of chlorine and adding lime. In general, whenever bleaching powder is replaced with chlorine, lime intended to neutralize the nascent acid must enter the place of the reaction either before or during the process of oxidation.

The Fundamental Principle

It would be far beyond the scope of this article to attempt an enumeration of all the variations of the process that are possible as long as the fundamental principle remains the same—namely, that the oxidation of arsenious acid or its compound must take place in a solution where the free hydrogen ions are reduced to a minimum, by means of the neutralization of the acid. In the chlorine methods of manufacturing calcium arsenate arsenious acid is not essentially the original arsenical compound; various arsenites, preferably that of calcium, may be used instead. Accordingly, it may appear advisable to evolve a process wherein arsenites in preference to arsenious acid would be obtained directly from arsenical ores. Our present experiments are being conducted in that direction. We should like to add that the processes described are applicable to a large extent to the manufacture of magnesium arsenate, which for dusting purposes may prove to be superior to calcium on account of lower solubility. This is based on the fact that the solubility of calcium arsenate is below that of barium (100 parts of pure H_2O dissolve 0.055 part of $Ba_3(AsO_4)_2$, as compared to 0.014 part of $Ca_3(AsO_4)_2$. (See F. Field, *J. Chem. Soc.*, London, vol. 11, p. 6, and Robinson, Bull. Oregon Agri. Sta. 31, issued in 1918.)

The present day excitement on the arsenic market and the increasing popularity of calcium arsenate seem to predict a fairly heavy demand for this insecticide during the 1924 season. On the other hand, overproduction of chlorine, which already begins to show signs of having acquired some "nuisance" value, will sooner or later compel the alkali manufacturers to find additional outlets for their cumbersome byproduct. These two factors alone seem to indicate that in the very near future a development and further application of chlorine methods in the production of calcium arsenate will no doubt place the insecticide industry among the other heavy consumers of chlorine.

Agitating And Mixing

The article under this head deals with one of the fundamental or unit processes of chemical engineering and its part in production

How to Use the Steam Jet for Stirring and Agitating

Some Notes on a Type of Equipment That Is Rapidly Gaining a Wide Application in the Chemical Engineering Industries

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STEAM jet apparatus is widely used for agitating and stirring liquids in chemical works. A jet blower will pick up a large volume of air or other gas and force it through a body of liquid, causing violent circulation and intimate mixture with all portions of the liquid of any precipitate or solid matter, and also of the gas used for agitation.

The steam jet blower may be used in a tannery for hastening the action of the baths and making possible the use of less lime, bate or tan. In the production of a stiff leather, such as sole leather, it has a great advantage over a paddle or drum in that the hide is not worked.

In the activated sludge process of sewage treatment steam jet apparatus can be used economically, especially in the small plant where the cost of a mechanical blower would not be justified. The steam will warm the sewage and hasten bacterial action.

Other chemical industries use the steam jet blower for agitation alone, and also for combining with agitation other functions, such as distilling off a volatile constituent, heating, or chemically treating with a gas.

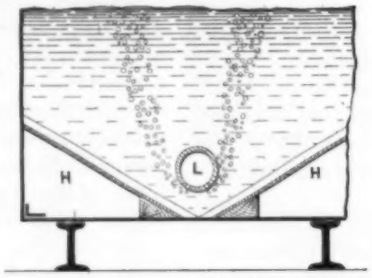

Fig. 2—Arrangement of Slanting Boards to Insure Agitation of Precipitate

A steam jet agitator has no moving parts, needs no mechanical power, and does away with motors and belts. A damp or corrosive atmosphere has no effect upon it, as there are no bearings, gears, electrical parts, belts or other easily damaged mechanism. As the blower may be lined with lead, corrosive gases may be used and chemical action combined with the stirring. The only portions of the apparatus exposed to the liquid are the perforated pipes in the tanks. As these, unlike paddles, propellers or other stirrers, are subjected to no mechanical strain, they may be made of soft or brittle material such as lead, high-silicon iron, or any other substance suitable for resisting the action of the liquid in the tank.

The small size of the jet blower makes installation easy, requiring no special foundation and no connection other than one steam pipe. It can be placed where it will not be in the way of attendants or employees. There are no obstructions over the tank and no moving parts to catch the clothing. The inside of the tank is entirely open and clear. Frequently a bath containing large solid bodies, such as a tan bath, must be stirred. Mechanical appliances would tear the hides; air cannot.

The jet apparatus is low in first cost and inexpensive to operate and maintain. The price is about one-fifth of that of an air pump adapted to handle an equal volume of gas. Steam consumption is low. In fact the stirring can often be considered as gratis, no more steam being used than would be needed for heating alone. There are no bearings to be lubricated, no glands or stuffing boxes to be tightened, no moving parts to break, and nothing to wear out.

The apparatus used is shown in Fig. 1. A steam blower forces the mixture of steam and air through the holes in the pipe laid on the bottom of the tank, and so agitates the liquid. By using different designs of blowers, the relative quantities of steam and air may be varied, and the relative amounts of heating and of stirring changed.

The exhauster is placed above the highest level of the liquid in the tank, so that under no conditions will the liquid back up into it. Steam and air connections lead to the blower, and a delivery pipe leads from it. The delivery pipe goes to the bottom of the tank, where it is connected to the distribution pipe. One pipe is sufficient for a tank up to 27 to 28 in. in width; for a wider tank it is advisable to space them about every 20 in.

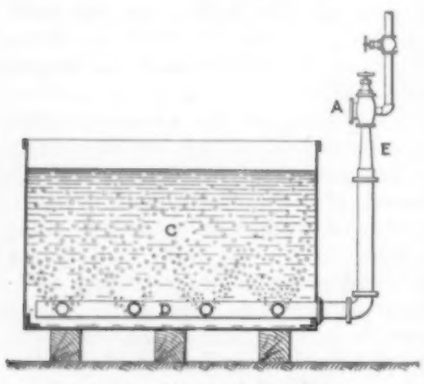

Fig. 1—Steam Jet Agitator

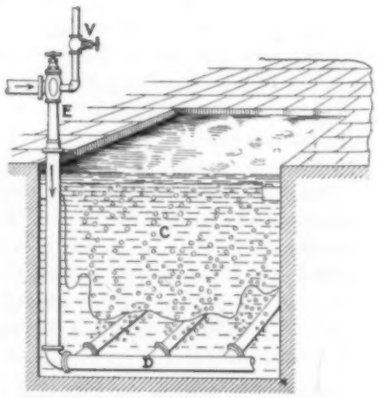

Fig. 3—Application of Jet Agitator to Tannery Pit

TABLE OF CAPACITIES

Suitable for Tank of a Capacity of, Cu.Ft.	Diameter of Pipes Steam	Air
30 to 70	¾	1¼
70 to 150	1	2
150 to 300	1	2½
300 to 600	1¼	3

Slanting boards, as shown in Fig. 2, are generally placed on both sides of each pipe to direct the circulation and also to convey toward the point of greatest turbulence any sediment, precipitate or solid matter.

Evenly distributed in a double row along the under side of the pipes are small holes. By directing the air downward the best circulation is obtained. The combined area of the holes should not be more than twice that of the air inlet. The diameter of each individual hole must not be over ⅛ in., if full effect is to be taken of all the air used.

If it is desired to use a steam jet exhauster for stirring a substance which must not be heated or which must not be diluted with steam or condensate, a device like that shown in Fig. 5 is used. The liquid is placed in a closed vessel and the air is sucked from it by means of the exhauster. Atmospheric pressure then forces air through the distributing pipe in the usual manner.

The steam jet will not blow air against a pressure of more than one-seventh of the steam pressure, or produce a vacuum of more than 25 in. of mercury. That the head of the liquid shall not exceed these values is the only limit to the shape or size of tank employed. The size of the air and steam connections for blowers used for various volumes of liquid is given in the attached table.

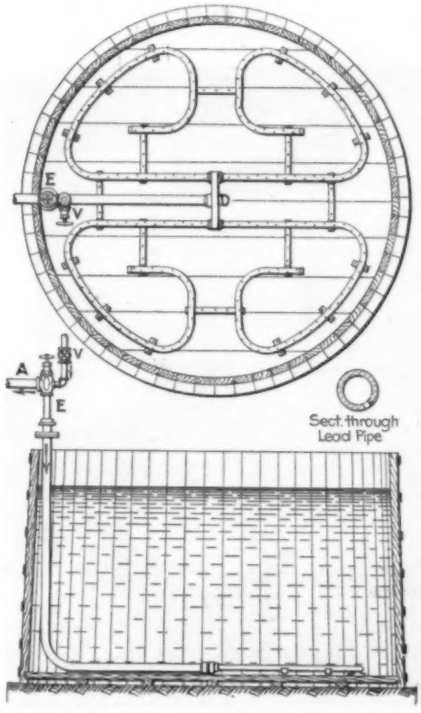

Fig. 4—Arrangement of Air Agitator Pipes in Round Tanks in Chemical Works

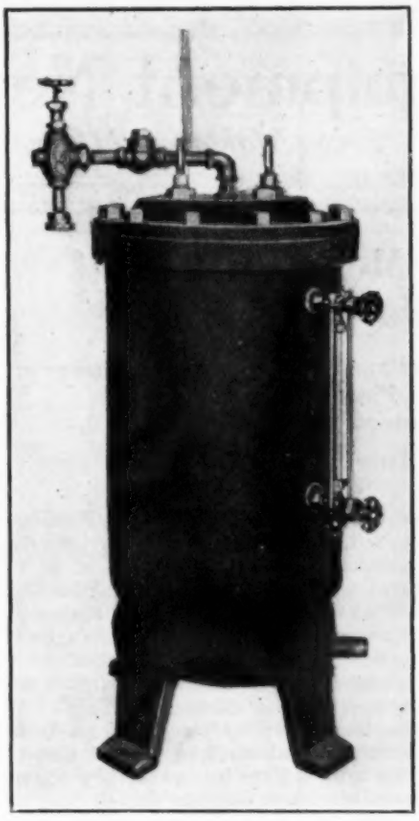

Fig. 5—Jet Connected to Sink Gas Through Liquid

Computing Savings With Material Handling Equipment

The Materials Handling Division of the American Society of Mechanical Engineers has developed formulas for computing the economies of labor-saving equipment. The whole problem is considered to be one of comparative costs and the following rule for setting a value upon labor saved by an improved process has been developed:

Whatever valuation is arrived at in cost accounting as the cost per unit of labor used in production, also establishes the value per unit of labor saved by an improved process. For simplicity, no monetary value need be placed upon labor employed in comparative processes, except upon the amount of difference in labor required at the current rate paid plus "burden" or an equivalent.

In calculating comparative cost, a new item is introduced which very likely becomes a factor in regular cost accounting and which the engineers and economists recognize—namely, the monetary value of increased production. Improved methods or devices will reduce the cost of making an article, since more are produced in a stated time, which is the same as reduction in one or more of the items of directly applicable cost. The rule is therefore:

In a comparative accounting, increased production will always carry a higher value than that attached to normal production.

With the above consideration as a foundation, the formulas for calculating economies of labor-saving equipment are set forth herewith.

A = percentage allowance on investment

B = percentage allowance to provide for insurance, taxes, etc.

C = percentage allowance to provide for upkeep

D = percentage allowance to provide for depreciation and obsolescence

E = yearly cost of power, supplies, and other items which are consumed, total in dollars

S = yearly saving in direct cost of labor in dollars

T = yearly saving in fixed charges, operating charges or burden, in dollars

U = yearly saving or earning through increased production, in dollars

X = percentage of year during which equipment will be employed

I = initial cost of mechanical equipment

Z = maximum investment in dollars justified by the above consideration

Y = yearly cost to maintain mechanical equipment ready for operation

V = yearly profit from operation of mechanical equipment.

$$Z = \frac{(S + T + U - E)X}{A + B + C + D}$$

$$Y = I(A + B + C + D)$$

$$V = [(S + T + U - E)X] - Y$$

Feeling that handling machinery, even if left idle a large part of the year, would probably require, under most conditions, approximately the same repair through deterioration as though in use, the committee makes no deduction for such lack of use in the estimated cost of upkeep C. If greater accuracy be considered necessary, use C multiplied by X in place of C in the formulas.

Equipment News

From Maker and User

Improved Electric Melting Furnace for Alloys

Description of the New Type Radiant Dome Electric Furnace Recently Installed in the Plant of the Miller Industries, Canton, Ohio

By T. F. Baily
The Baily Furnace Co., Alliance, Ohio

THE furnace requirements of the Miller Industries are unusually severe, as its product requires a wide range of metals, running from yellow brass, bronze and red brass to alloys containing 50 per cent nickel. This company has been a user of the resistance type furnace for years with success, but the slow rate of heating up of the older type was particularly objectionable under conditions existing at the plant and the range of temperature was hardly adequate for melting high nickel alloys.

The requirements laid down for the new installation were more rapid heating up, higher melting rate and higher temperature range. It was also desired to have some convenient means for readily renewing the heating element so as to avoid the long delays in repairs formerly experienced when the resister trough needed to be replaced. The company also wished to eliminate the piers for the trough supports used in the old type of resistance furnace, so as to obtain a larger furnace chamber capacity, which would be particularly desirable when charging light scrap or turnings. As the company occasionally wished to refine metal, it was desirable to have a basic hearth, so the furnace described herewith was provided with a magnesite bottom similar to that used in steel-melting furnaces. This bottom was baked in place with a temperature of above 3,400 deg. F., temperature readings being taken by Segar cones placed on the hearth.

Although at the present time only 100 kw. is available from the power house, the furnace itself has a rating of 150-kw. capacity and a melting rate of 1,000 lb. per hour, with a maximum hearth capacity of 2,000 lb. The company's present requirements are for a maximum size heat of 1,000 lb. and this size of charge of red brass is melted in less than 1½ hours from pour to pour, with a power consumption of 100 kw. per hour, or 300 kw.-hr. per ton. At full electrical input of 150 kw. per hour, this furnace has a melting rate of more than 1,000 lb. per hour and a current consumption of approximately 250 kw.-hr. per ton.

From the heating up curve (Fig. 3), it will be noted that the furnace came from cold to 2,500 deg. F. in 11 hours with an average current input of approximately 80 kw. per hour, or 880 kw.-hr. for the period, and reached a temperature of 3,400 deg. F. in 19 hours from cold with an average input of approximately 85 kw. per hour, or 1,615 kw.-hr. for the entire period.

The furnace itself is made in three parts. The base, which contains the magnesite hearth, comes to the top of the floor line. The middle section contains the self-supporting heating element, electrodes and terminals. The roof rests directly upon this middle section. When a new resistor ring is required, the roof is removed, the old resistor section taken off and a spare resistor section already prepared is placed in the furnace, the same as though it were a spare roof. To obviate the difficulty experienced in making sound resistor troughs, the new type resistor container is made of special shaped brick sections, which are readily molded and baked without danger of cracking.

The furnace is supplied with a rocker type tilting arrangement so that the center of gravity remains in the same plane throughout the pour, and

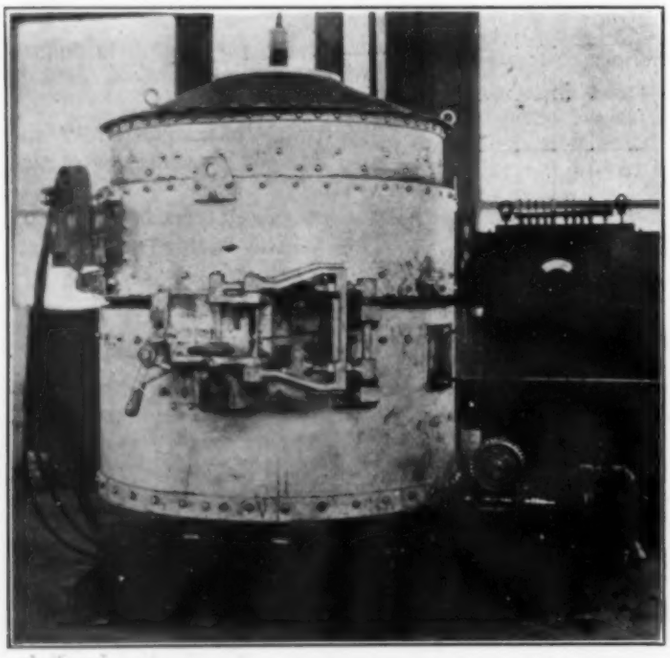

Fig. 1—Baily Furnace Showing Tilting Mechanism and With Door Closed

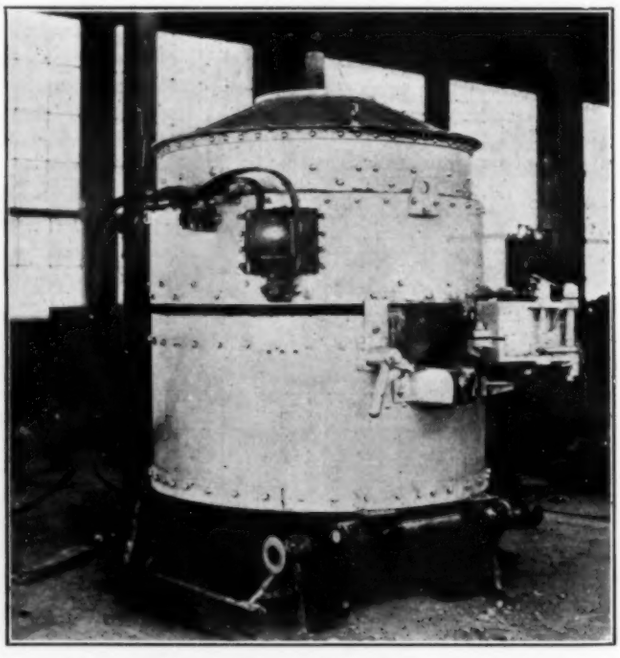

Fig. 2—Baily Furnace With Door Opened Showing Electrical Connections

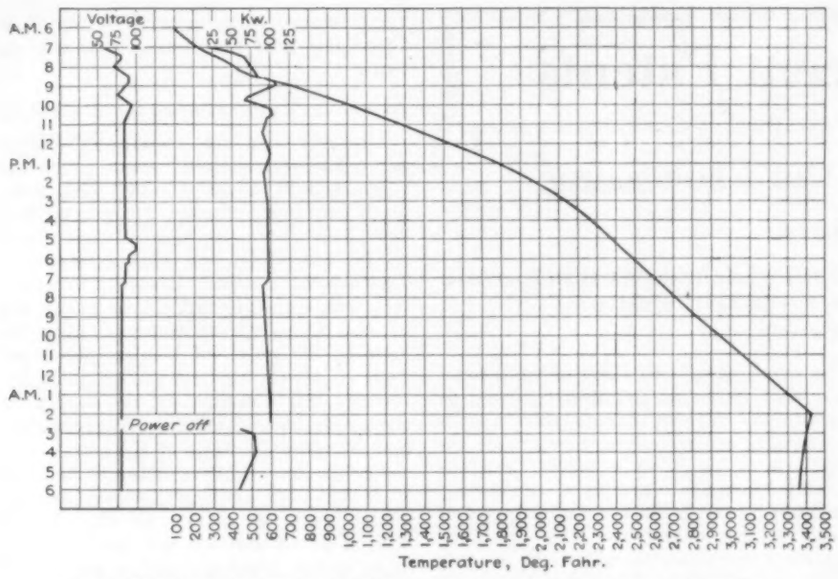

Fig. 3—Heating Up Curve of Baily Furnace Used at the Miller Industries

as the furnace moves forward, the front lowers and the rear of the furnace raises, the nose of the furnace describing almost the same arc as the stream of metal flowing from the furnace. The tilting of the furnace is done by means of a 2-hp. motor operating through a double worm reduction, the final worm wheel being keyed to the rear shaft which supports the rear rocker arms.

The operation of this furnace has demonstrated that the former limitations of the resistance type furnace as to melting rate, power consumption and temperature limitations have been overcome, together with the elimination of long delay in repairs when a resistor trough required renewal.

Equipment for Difficult Screening

Description of Vibrating Screen Which Is Adapted to the Screening of Many Materials

By L. H. Sturtevant
Vice-President, Sturtevant Mill Co., Boston, Mass.

Separating or sizing large quantities of materials so accurately as to have the tailings free from fines always presents a problem. This is especially so with damp and heavy materials.

Revolving screens or "trommels" are far from satisfactory for sizing below ¾ in. They use less than one-third of their area at one time, do not clean their product properly and for finer grades of separation are not efficient. Bumping screens are expensive in upkeep, clog easily and lack capacity. For this last reason especially, they are not well adapted to accurate sizing of large tonnage.

Because of the objections to other types cited above, vibrating screens are being more and more widely used for difficult screening. It is generally conceded that these machines have come to stay and will eventually displace the less efficient devices at present in use. The principles upon which a good vibrating screen must operate are well defined. To keep meshes open, vibration needs to be intense, every wire rapidly quivering and only enough amplitude to force back all particles too coarse to pass through the screen openings and prevent wedging. If this vibration is sufficient, no particle, no matter how damp, can adhere to the wire; also, if the lumps of material are kept constantly hopping and rubbing against one another while in the air and on the screen surface, the adhering fines will be dislodged and when freed will immediately pass through the open meshes.

The factors that make up good vibration are, then, type of vibration, rapidity and amplitude. These should be such as to clear the coarser materials of adhering particles and keep the screen meshes free from obstruction. This vibration should be confined to the screen clothing, not destructive to it and not transmitted to the screen housing, foundation or supports. This is now being accomplished in the screening of substances so hard to handle as formerly to be considered unscreenable.

The accompanying cuts illustrate a successful mechanism for this purpose which is a Heavy Duty Moto-Vibro Screen, made by the Sturtevant Mill Co. of Boston, Mass., built to handle large tonnage of any screenable material, wet, damp or dry, within reasonable limits. It consists of an open box (inclosed for dusty substances) amply heavy to support the vibrating mechanism. Within this box is placed one or two especially constructed screen frames covered with wire cloth. This frame is strong yet sufficiently springy to transmit vibration, like a tuning fork, to the screen wire attached thereto. The frame or frames are strongly pressed aganst a vibrating stirrup attached to a small throw, high-speed eccentric of variable speed; thus the amplitude, intensity and rapidity of the vibrations may be tuned to suit the particular material being screened.

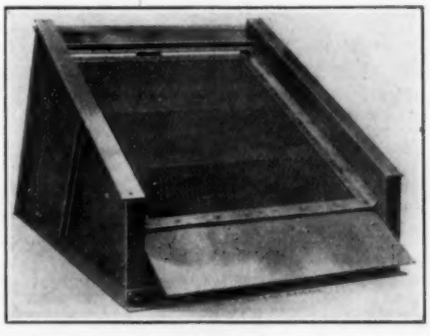

Fig. 1—Front View of Open Type Moto-Vibro Screen

The result is a series of impulses similar to a massaging vibrator, railroad ballast tamper or power riveter, varying in throw and speed according to conditions, confined to the wire and screen frame, light enough hardly to be seen, yet of such intensity as to sting the fingers when touched or of sufficient amplitude to throw a 2-in.

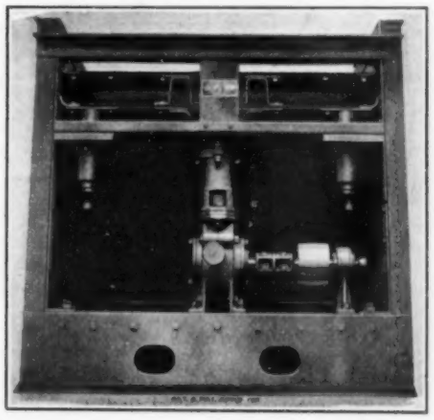

Fig. 2—Rear View of Moto-Vibro Screen, Showing Vibration Mechanism

pebble 10 ft. in the air. It is hard to conceive how anything can stick to the wire, wedge in the screen holes or stick together when rattling over this rough and shivering surface.

Imagine a pebble coated with damp sand dancing up and down on a rough wire screen from 1,800 to 3,600 times a minute, bumping into other pebbles, bouncing here and there, receiving and giving sharp impacts, scouring against the hard wire with gaping openings ready to let the dislodged sand escape and rejecting the pebbles, which are sent scampering down the screen to the reject pile. Because the wire is continually jarred by continuous vibration, short and sharp impacts, the flexing is minimum and therefore it is not easily broken. It is neither dangerously stretched or distorted. The screen frame is supported only by the casing, so no crytallization or damaging shake is transmitted to the case, foundation or building.

Review of Recent Patents

Developments in the Processing of Coals

Continued Activity in the Important Field of Refining Coal to Increase Its Fuel Value or Recover Byproducts Is Evidenced in Recent Patents

ALTHOUGH the byproduct coke oven has reached a degree of perfection in design which permits its utilization in a highly profitable manner, there is still room for great improvement and refinement in its structural and operating details. This fact is well illustrated by the continued inventions made, both by large interests in this field and by independent students.

As an illustration of the former case, a recent patent of the Koppers Co. is a good example. (Joseph van Ackeren, of Pittsburgh, Pa., assignor to the Koppers Co. of Pittsburgh, Pa., 1,469,491, Oct. 2, 1923.) The object of this invention is to maintain combustion constantly in all the heating flues of each oven wall and retain at the same time the reversal system and regenerator by which the waste heat of the burned gases is conserved.

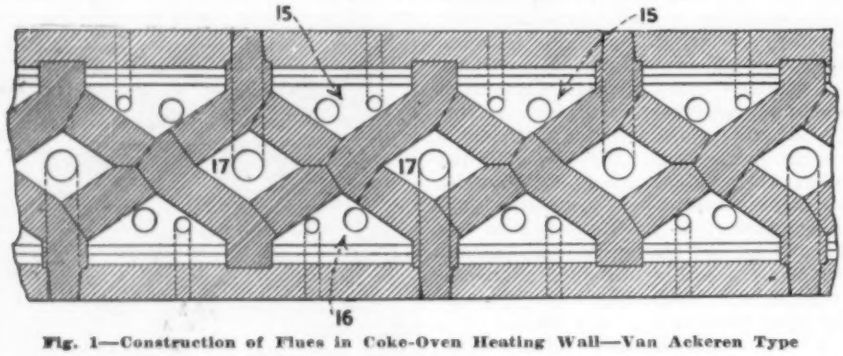

Fig. 1—Construction of Flues in Coke-Oven Heating Wall—Van Ackeren Type

In order to attain this end the flues in each oven wall are arranged as shown in Fig. 1. The walls are constituted of two series, 15 and 16, of vertical combustion flues substantially triangular in shape. These two series of flues face, respectively, the ovens on either side of the heating wall. Along the center of the heating wall and between the two rows of flues are the vertical channels, 17, which operate alternately as air inlets and as waste gas outlets.

In operation, when a series of flues as 15 is being fed with gas from the bottom, the flues 16 of the same heating wall are being fed with gas from the top. In this manner up-burning flame is being maintained in all the flues of a series on one side of a heating wall, while simultaneously down-burning flame is maintained in the other series. Hence, throughout the battery, combustion is maintained in all of the flues, notwithstanding reversal of flow through the regenerators and in the flues, with the result that both sides of each heating wall are being constantly heated by constantly burning flames, temperature conditions are equalized throughout the battery or plant as a whole, and the coking process proceeds uniformly without interruption from end to end of each coking chamber. The combined up-flame and down-flame in each heating wall results in a considerable extension of the capacity of the wall to maintain coking temperature in a vertical direction, thereby permitting an increase in the height of the heating walls, with a consequent increase in the height of the coking chambers and their individual coking capacity.

When flame is up-burning the channel 17 serves to connect to the regenerator for the purpose of leading off the waste gas, one channel 17 doing so for two adjacent flues. The waste gas of the series of flues on the other side of channel 17—the down-burning series—passes out directly to the regenerator. This last series receives its heated air from combustion from alternate channels 17, while the first series of flues receives its air direct from the regenerator. Reversal of these conditions with regard to flow also reverses the regenerators with regard to which is absorbing heat and which is giving up heat.

Attaining Uniform Coke-Oven Heating

Uniform heating conditions within the coke-oven chamber seem to be the most sought after quality just now. Such was the purpose of the invention described above, as also of that about to be described. In this latter case (1,466,663, Eugène Lecocq, Brussels, Belgium, Sept. 4, 1923), the ovens are of the so-called waste-heat type, the heat in the gases of combustion being used in steam raising rather than for heating the combustion air supply of the ovens, as is done in the regenerative and recuperative type of coke oven.

In this invention the attempt is made to secure even heating of the coke-oven retort walls as shown in Fig. 2. It will be noted that air and gas are supplied to the heating flues in groups of six and that there is a separately heated flue at each end of the series so that extra heat can be supplied to make up for radiation through the oven doors.

Widening Utility of Water-Gas Process

In the past, the water-gas manufacturing industry has always been under the necessity of employing coke or anthracite coal as its raw material. A recent patent (Daniel J. Young, Tacoma, Wash., assignor to Young-Whitwell Gas Process Co., 1,468,190, Sept. 18, 1923) offers a method by which other fuels as bituminous coal and lignite can be used as raw material and the excess heat generated with such raw material effectively used.

In Fig. 3, 1 is the generator, 2 the carburetor and 3 the superheater. A pipe 4 connects the upper parts of 1 and 2 with a bypass 41 to the lower part of the generator. Pipe 43 connects the lower part of the carburetor to that of the superheater. The gas offtake is at 31, with a stack valve 32. Enriching oil enters the carburetor at 21. Pipe 6 supplies steam to the bottom of the generator and pipe 61 to the top, while 62 supplies steam to the discharge of the superheater. Pipe 8 is a gas offtake. Air is supplied for blasting through pipe 50. Pipes 52 and 54 are supplemental air supply pipes.

In operating in accordance with the usual practice of a water-gas plant, an air blast would be introduced for a period beneath the grate 11 and would

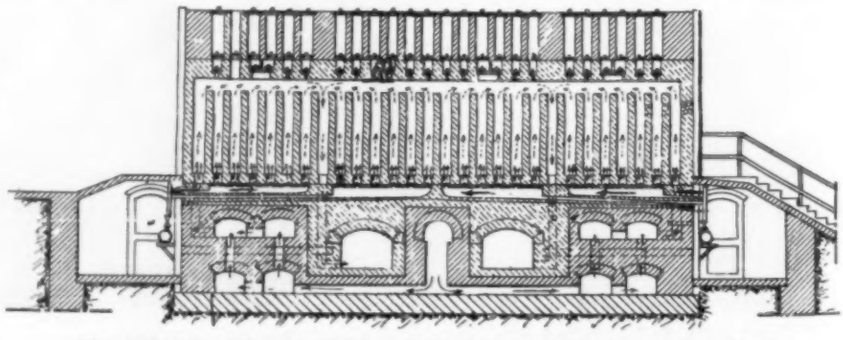

Fig. 2—Section Through Heating Walls of Lecocq's Design of Coke Oven

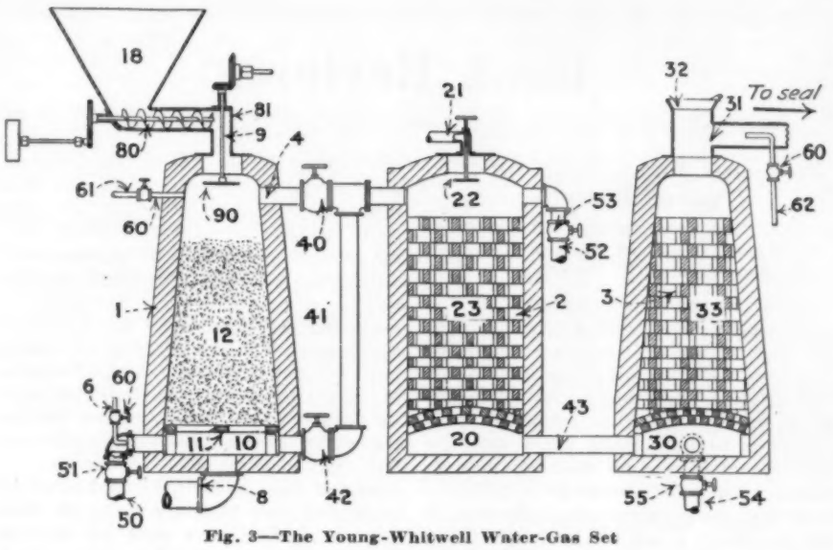

Fig. 3—The Young-Whitwell Water-Gas Set

pass up through the fuel bed 12. Supplemental air would also be introduced when desired through pipes 52 to the carburetor and pipes 54 to the superheater, as may be necessary for proper combustion. This blast gas would be passed over through the pipe 4 to the carburetor, through the checkerwork 23 therein, taken through the pipe 43 to the superheater 3 and up through the checkerwork 33 and out through the stack valve.

In the gas-making run the air supply from pipes 50, 52 and 54 would be discontinued and steam introduced through the pipe 6 or pipe 61 according as the run was up or down. During this run oil would be introduced through the pipe 21 and the operation would be exactly in conformity with the usual gas-making run of a water-gas plant.

On the other hand, in this invention the blasting run is carried to a point where the checkerwork in both the carburetor and the superheater is raised to a somewhat higher temperature than would be required by the operation of the usual water-gas process.

Instead of following this blasting operation by the usual gas-making run, in which steam is first passed through the fuel bed in the generator, steam is introduced from pipe 62 into pipe 31. This steam is passed in a reverse direction to that usually employed, first through the superheater, then through the carburetor and finally through the incandescent fuel in the generator, where it is broken up, the resultant gas being taken out at the point where air and steam would normally be introduced to the generator, in carrying out the usual water-gas process, by pipe 8. This steam absorbs heat from the superheater and the generator until it is highly superheated. When it reaches the generator it comes in contact with the fuel. It is sufficiently hot to volatilize some of the constituents of the coal, particularly if the coal be finely powdered. If an up-run is employed the gas offtake 8 is closed and steam admitted through the pipe 6, the steam passing upwardly through the fuel bed, thereby generating water gas, which is then passed through the carburetor and superheater. Where a down-run is employed, steam is admitted through pipe 60 and passes in a downward direction through the fuel bed. The gas generated thereby is taken off through the valve 42 and the upright pipe 41, passing thence through the carburetor and superheater. The result is the formation of a considerable amount of coal gas, which is passed through the incandescent fuel and discharged through the pipe 8.

Reversing the flow of gas through the entire plant may be accomplished by the use of valves which may be placed in the pipes 8 and 31 respec-

American Patents Issued November 20, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,475,189—Method and Appliance Useful in Producing Welded Joints. Adolf Krebs, Jamaica Plain, Mass.

1,475,198—Electroplating Apparatus. Louis Potthoff, deceased; by Hamilton Trust Co., executor, Brooklyn, N. Y.

1,475,215—Process for the Manufacture of Yeast. Alfred Wohl, Danzig-Langfuhr, Free City of Danzig, assignor to Fleischmann Co., New York, N. Y.

1,475,243—Distilling or Refining Column. Emil Piron, New York, N. Y., assignor to Piron Coal Distillation Systems, Inc., New York.

1,475,244—Filter. Louis C. Rolls, Hedley, British Columbia, Canada.

1,475,291—Suction Gas Plant. Gustav Erdbrügger, Bad Oeynhausen, Germany, assignor, by mesne assignments, to Albert Weber, New York.

1,475,314—Method of and Apparatus for Evaporating Liquids. Martin J. O'Boyle, Cleveland, and Edward C. Holton, Olmstead Falls, Ohio, assignors to Sherwin-Williams Co., Cleveland, Ohio.

1,475,323—Centrifugal Drum. August Schmücking, Essen, Germany, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany.

1,475,327—Absorption and Condensing Apparatus. Stephen L. Tyler, Brooklyn, N. Y.

1,475,365—Apparatus for Measuring High Temperatures. Julian L. Schueler and Chester A. Kellogg, Bartonville, Ill.

1,475,382—Chain for Elevating Liquids. Emile Gennevois, Chatellerault, France, assignor to La Societe Anonyme das elevateurs de Liquides "Chaine-Helice" Bessonuet-Favre, Chatellerault, France.

1,475,446—Process for the Manufacture of Artificial Resins from Phenol and Formaldehyde. Isidor Pollack and Erich Möhring, Vienna, Austria.

1,475,471—Process of Manufacturing Yeast. Robert L. Corby, Chevy Chase, Md., and Ruth Glasgow, Pittsburgh, Pa., assignors, by mesne assignments, to Fleischmann Co.

1,475,477—Process of Making Fatty Acid Compounds. Carleton Ellis, Montclair, N. J.

1,475,492—Hydrated Calcium Nitrate and Method of Making Same. Herbert J. Krase, Clarendon, Va., and Jew Yam Yee, Washington, D. C.

1,475,494—Process for the Manufacture of Yeast. Henry A. Kohman, Roy Irvin, and Robert J. Cross, Pittsburgh, Pa., assignors, by mesne assignments, to Fleischmann Co.

1,475,496—Gas Generator. Carl Läuchli, Dubendorf, near Zurich, Switzerland, assignor to the Firm Continental-Licht-und Apparatebau-Gesellschaft, Frankfurt-on-the-Main, Germany.

1,475,502—Method of Revivifying Finely Divided Fullers Earth, Bone Char, and the Like. Fred W. Manning, Brooklyn, N. Y., assignor to Manning Refining Equipment Corporation.

1,475,522—Art of Preparing Alkyl Derivatives of Organic Compounds. Eugene Theimer, Newark, N. J., assignor, by mesne assignments, to R. F. Steward, Washington, D. C.

1,475,545—Arsenate of Lime Product and Process of Making Same. Louis Charles Drefahl, Lakewood, and Charles H. Sakryd, Cleveland, Ohio, assignors to Grasselli Chemical Co., Cleveland, Ohio.

1,475,563—Purification of Brines. Benjamin Talbot Brooks, Bayside, N. Y., assignor to Mathieson Alkali Works, New York.

1,475,638—Mixing Apparatus. Archibald Montgomery Low, London, England, assignor to Low Engineering Co., Ltd., London, England.

1,475,639—Air Washing and Conditioning Apparatus. Joel Irvine Lyle and Leo L. Lewis, Plainfield, N. J., assignors to Carrier Engineering Corporation, New York.

1,475,650—Glass-Melting Pot. Frank Osborne, Ford City, Pa., assignor to Pittsburgh Plate Glass Co.

1,475,663—Manufacture of Soap. Jicknam Tseng, London, England.

1,475,705—Safety Joint for High-Pressure Gas Apparatus. Walter Francis Keenan, Jr., New York, N. Y., assignor to Powers Specialty Co., New York.

1,475,739—Means for Replenishing the Electrolyte of Electrolytic Cells. Porter H. Brace Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Co.

1,475,881—Coke Oven. Arthur Roberts, Evanston, Ill., assignor, by mesne assignments, to Chicago Trust Co., trustee, Chicago, Ill.

1,475,901—Apparatus for Distilling Hydrocarbons. Carey W. Thompson, Denver, Colo.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

tively. By thus reversing the flow of gas through the plant the necessity for reversing the flow within the generator itself is avoided and the hot valve 40 may be dispensed with entirely. Similarly the valve 42 and pipe 41 of the old form of gas plant are rendered ineffective and may be eliminated in a new plant.

The steam in passing through the superheater and the carburetor comes in contact with any carbon which may have been deposited therein during the operation of the plant in the usual manner of a water-gas plant. This carbon, being highly heated and incandescent, combines with the steam to make water gas, thus securing two desirable results, one the utilization of this carbon for the making of gas and the other the prevention of clogging of the superheater and the carburetor with carbon and the resulting necessity of cleaning the same. The superheated steam is also further acted upon by the incandescent fuel bed of the generator to produce more water gas. The gas produced during this run of the apparatus is a combination of coal gas and water gas.

When the superheater and the carburetor have, by such a run as just described, been reduced in temperature to that which is most desirable for the operation of a water-gas plant, this flow of steam is cut off and the usual flow of steam, either up or down as is customary in usual water-gas operation through the fuel bed in the generator, is commenced, the gas thereby formed passing on through the carburetor and superheater. During this run the supply of coal to the generator is discontinued and the supply of oil to the carburetor is commenced. When the fuel bed has been reduced to the minimum desirable temperature for gas making, this water-gas-making run is stopped and the blasting run is started, after the usual manner of handling a water-gas plant.

One means for introducing coal or other fuel to the generator is the apparatus illustrated. It consists of a hopper 18 for containing powdered coal, a screw feed 80 by which this is delivered in regular amounts to the charging pipe 81, by which it is admitted to the generator. It also includes a revolving shaft 9, to which is secured a disk 90, upon which the coal falls and from which it is discharged so as to be distributed instead of all being deposited at one point.

With this apparatus the excess heat which has been found to be generated when coal is used for charging the generator is utilized in the superheating of the steam and this in turn for the volatilization of the raw coal which is being charged in the generator, thus forming a certain amount of coal gas which is added to the water gas. This heat is therefore usefully used instead of being wasted, as was the case in such apparatus when charged with bituminous coal and operated after the manner of the usual water-gas plant operation.

Book Reviews

Personnel Management for the Business Executive

APPLIED PERSONNEL PROCEDURE. By *Frank A. Weakly*. 192 pp. McGraw-Hill Book Co., New York, 1923. Price, $2.

When an executive arrives at the point where he is willing to admit that the supervision of personnel might be regarded as a definite function in his organization, his next step is to inquire just what the proposed procedure is to be. Some years ago the usual practice was to send someone to visit a plant where some form of functionalized personnel supervision was in use, to obtain a set of the forms there used and acquire a general understanding of their method. In other cases procedure was invented, proceeding like a Columbus exploring a new world of thought. Either method was likely to give unsatisfactory results. The plant studied may have had quite different conditions from the one at which the methods were to be applied, and unless fundamental principles were understood disaster might result. The second method is as wasteful of mental energy as it would be for each engineering office to attempt to design and make its own slide-rule, with the possibility that the finished product might be inferior to types that could be obtained ready made. Mr. Weakly meets this situation by presenting in a brief way the general form of personnel procedure as it has been developed by experience. In the light of a book like this the executive mind is enabled to concentrate on the real problem, which is whether a personnel department is needed in that particular organization and if so to what extent shall it be developed.

The brief categorical way in which the author treats his topics is wholly good from the viewpoint of the business executive, but introduces real dangers in case the book is used as a manual of procedure in a small personnel department. Personnel management is not susceptible to analysis with mathematical accuracy; one cannot be categorical. For example, in listing positive and negative traits of character indecision is unhesitatingly put down as negative, and one wonders whether the writer ever heard of the mathematical philosopher who after careful study of the whole field of knowledge concluded that the only thing of which he was certain was that he doubted. To the executive it is often necessary to be definite, even about indefinite things, otherwise he will not listen, but the worker in the personnel field needs to keep his mind open, and not divide the whole field of his work into a series of pigeonholes, into one or another of which everything can be unerringly put.

The two paragraphs on pages 20 and 21 in which phrenology and "contourology" are dextrously evaded rather than discussed are doubtless also written for the eye of the executive who may have personal opinions that it is idle to attempt to controvert. Certainly the author must be aware that the shape and appearance of a man's outside have no relation to his mental and moral characteristics, and that this is much more certain than many other matters on which he makes categorical statements.

A curious feature of the book is that safety, the phase of personnel work on which companies have on the average lavished the most attention, is mentioned only once, on page 5, as a phase of personnel work that may be included in his ideal layout.

Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

THE ELECTROCHEMICAL CHARACTER OF CORROSION. *Ulick R. Evans.* First part of a paper read at autumn meeting of the Institute of Metals in England. *Brass World*, November, 1923, pp. 367-371. (Will be continued in December issue.)

HELP WANTED BY TECHNICAL COLLEGE MAN. *George P. Bowman.* An article in which a man of broad experience in finding positions for engineers makes some extremely pertinent observations on the engineer and the job. *Iron Age*, Nov. 29, 1923, pp. 1437-1440.

WELDING ALL-STEEL AUTOMOBILE BODIES. *Joseph W. Meadowcroft.* Production methods and equipment employed in a large plant where welding is done with great efficiency on a large scale. *Iron Age*, Nov. 29, 1923, pp. 1437-1440.

MAKING THE REFINERY SHOW A PROFIT BY REDUCING OPERATING COSTS. *Paul Truesdell.* Article I—Reclaiming Still Gases. This is the first of eight articles based on field investigations at principal refinery centers. *National Petroleum News*, Nov. 28, 1923, pp. 23-5.

THE OIL SATURATION VALUE OF BLEACHING EARTHS AND CARBONS. *Herbert Bailey* and *J. Henry Allen.* Report of a research made by Southern Cotton Oil Co., *The Cotton Oil Press*, December, 1923, pp. 36-7.

SCIENTIFIC METHODS OF MAKING CONCRETE. *Duff A. Abrams.* A brief review of theory and art. *Chemistry & Industry*, Nov. 16, 1923, pp. 1094-8.

SOME CONTROL FORMULATE IN LEACHING AND EVAPORATING. *F. G. Donnan.* An explanation of mathematical expressions used in controlling working results in the Chilean nitrate industry. *J. Soc. Chem. Ind.*, Nov. 16, 1923, pp. 440T-442T.

The book is evidently written for the business executive, and for him it is admirable, but the beginner in the personnel field should read it with caution, for it may cause him to develop fixed opinions on matters that are as yet, and perhaps long will be, quite uncertain.

T. T. READ.

Professor Pupin's Autobiography

FROM IMMIGRANT TO INVENTOR. By *Michael Pupin*, professor of electromechanics in Columbia University. 400 pp. Charles Scribner's Sons, New York. Price, $4.

Here is a book that every American scientist or engineer should read, but the duty would be a pleasant one. Not only is the book an enticing tale of the rise of a Serbian peasant boy to be a distinguished professor, inventor and scientific idealist, but it is also a valuable summary in readable language of some of the great scientific discoveries of the past century, particularly the electromagnetic theory of light and of matter.

Nearly 50 years ago a boy of 15 landed in New York with 5 cents in his pocket and a Turkish fez on his head. Within a few minutes he had spent the 5 cents for a piece of prune pie that turned out to have only prune-pits inside, and a street-boy had knocked the fez from his head. Thus began a series of adventurous struggles to learn what Americanism means; the adventures included driving a mule on a farm, working in a cracker factory in lower New York and being inspired by the generosity and idealism that America displays to an attractive young immigrant. This Serbian boy talked eagerly to the people he met, and learned philosophy from boiler-firemen and "honey-hearted" American women. Would that more American professors could have knocked around and seen the world from such a point of view!

The young immigrant was graduated from Columbia University, became a naturalized citizen, went to England and studied, and finally obtained a doctor's degree at Berlin. While abroad he came under the influence of the work of Faraday, Maxwell and Lagrange, and was a student under the great Helmholtz. Other great scientists who figure in the pages include Tyndall, Lord Rayleigh, Lord Kelvin and Sir J. J. Thomson, and in America, Henry, Gibbs and Rowland.

Professor Pupin's inventions have been of great importance in long-distance telephony, wireless telegraphy and radio, and the utilization of the X-ray. But he is more than a successful inventor, he is a scientific idealist with the mind of a poet. The last two chapters of the book reveal the philosophy of this American professor who was once a dreaming peasant lad in the pastures of Serbia. In his mature opinion, the chaotic energy of the universe, which comes to us as radiation from the sun, is transformed by co-ordination into the sustenance of our organic life. This co-ordination is based upon the laws of resonance and harmony, and a similar process goes on in the intellectual and spiritual world. Such a philosophy of co-ordination can be thought of as a foundation of the theory of evolution.

What faults the book shows are more the consequence of a naïve generosity than the sentimental wordiness so common in autobiographies of successful men. There is a commendable absence, also, of the pious hypocrisy that is common in autobiographies.

P. B. MCDONALD.

New Publications

AN AMERICANIZATION PROGRAM. By E. J. Irwin. Bull. 30, Bureau of Education, Department of the Interior, Washington, D. C.

THE STRENGTH OF CONCRETE, ITS RELATION TO THE CEMENT AGGREGATES AND WATER. By Arthur N. Talbot and Frank E. Richart. Bull. 137, Engineering Experiment Station, University of Illinois.

NEW BUREAU OF STANDARDS PUBLICATIONS: Circular 148, United States Government Specification for Leather Belting, and Scientific Paper 475, on "Visibility of Radiant Energy," by K. S. Gibson and E. P. T. Tyndall.

Readers' Views and Comments

An Open Forum for Subscribers

The editors invite discussion of articles and editorials or other topics of interest

Foreign Patent Costs

To the Editor of Chem. & Met.:

SIR—In connection with the data on foreign patent costs given by Mr. Keyes in your October issue, which I have found valuable for checking up the cost of the extensive list of Dorr Company foreign patents, it may be of service to some of your readers to note that apparently Mr. Keyes has figured working charges throughout the entire life of the patent. These charges, however, are incurred only when the invention is not actually put into practice; and even the most optimistc owner will drop his patent long before its expiration date if he finds himself unsuccessful in introducing the invention and thereby obtaining a return on his patent investment. I, therefore, would suggest that the working charges in Mr. Keyes' table may safely be reduced at least 50 per cent.

GEORGE G. HYDE.

The Dorr Company,
New York City.

Weighted Index Number for Motor Fuels

To the Editor of Chem. & Met.:

Sir—In putting forward his weighted index number for motor fuels (*Chem. & Met.*, vol. 29, p. 970), Dr. Gruse remarks that "an integration of the entire distillation curve or a similar evaluation of the differential distillation curve would be a more rational expedient; the procedure outlined recommends itself, however, because of its simplicity." Having sometimes had occasion to determine the average ordinate under the distillation curve, I have made use of a method which is about as simple as the calculation of Dr. Gruse's index number and which gives a result very close to that obtained by actual integration.

The method is based on the application of Simpson's rule for determining the area under a curve. (Wilson, "Advanced Calculus," p. 77.) The interval between the initial point and the end point on the distillation curve is divided into an even number $2n$ of equal parts so that the $2n$—1 ordinates at the extremities of the intervals are T_0, T_1, ... , T_{2n}. Then the average ordinate is computed as

$$\frac{1}{6n}\left[4(T_1 + T_3 + \ldots + T_{2n-1}) + 2(T_0 + T_2 + \ldots T_{2n}) - T_0 - T_{2n}\right]$$

For accurate work to four or even five figures, the number of intervals should be about ten, but ordinarily four intervals are sufficient. Thus in the case under consideration I have calculated the average ordinate of the distillation curve from the expression

$$\frac{1}{12}\left[T_0 + 4T_{25} + 2T_{50} + 4T_{75} + T_{100}\right]$$

where the subscripts indicate the percentage of distillate corresponding to the respective temperatures.

This method differs from that of Dr. Gruse in taking account of the initial point, which he omits entirely, and in using the 25, 50, 75 and end points in place of the 10, 20, 50, 70, 90 and end points which he uses. Moreover, the weights are differently assigned. Dr. Gruce arbitrarily assigns certain weights which he has found satisfactory by a process of trial and error. The coefficients in the foregoing expression, on the other hand, follow from Simpson's rule and are simply consequences of the geometrical relationships on which the rule is based.

The table below shows the results of the calculations for the four co-operative gasolines, using both methods.

	Index Number, Deg. C.	Average Temp. From Curve, Deg. C. 10 Intervals	4 Intervals
A	815	123.6	123.1
B	853	129.7	129.1
C	910	138.6	137.7
D	967	146.3	145.6

It is clear that the shorter method gives results good enough for most purposes. Although the average temperatures are of a different order of magnitude from the index numbers, there is nevertheless a close correlation between them. When the figures above are plotted, they are found to lie fairly close to a straight line. Whether this relationship would hold as well for other motor fuels, including blended fuels, cannot be determined without comparison of more distillation

data than is available to me at this writing.

The approximately linear relation which Dr. Gruse has found between the index number and the dew point has its analog in a linear relation between the average temperature determined as above and the dew point. When plotted against the average temperatures, the dew points lie perhaps a trifle closer to the straight line than in the index number plot, but there is certainly not much to choose in this respect. There are not enough reliable dew point determinations available to afford a real test of this point.

I believe that the average temperature calculated as above is generally preferable to the index number, because the average temperature rests on a basis less arbitrary and empirical. Furthermore, in the case of blended fuels, containing casing head fractions, it would seem to be important to take more account of the initial point than Dr. Gruse does.

As regards simplicity and ease of calculation, the two methods are about on a par.

LOUIS WEISBERG,
Consulting Chemical Engineer.
New York City.

Men in the Profession

HOWARD W. AMBRUSTER has recently been engaged as consulting chemical engineer for a calcium arsenate plant at Monroe, La. Contrary to reports which have been circulated, this work has been merely of an advisory character and Mr. Ambruster has no intention of discontinuing his consulting office in New York.

WILLIAM H. BARR, head of the Lumen Bearing Co., Derby, N. Y., has been re-elected president of the National Founders' Association.

GEORGE J. CALDER of Sacramento, Calif., resident engineer on the local municipal filtration project, has opened offices in that city at 1010 Eighth St., as a consulting engineer.

L. H. COLE has returned to Ottawa after investigating the alkali deposits of Saskatchewan on behalf of the mines branch of the Canadian Government. He has a comprehensive report on the subject in course of preparation.

ALEXANDER FORWARD of Richmond, Va., has resigned as a member of the Virginia State Corporation Commission, to become secretary and manager of the American Gas Association, New York.

HOWELLS FRECHETTE, chief of the ceramics division of the mines branch of the Canadian Government is on a tour of western Canada with a view primarily to completing the store of materials for the Canadian ceramic exhibit at the British Empire exhibition.

MATTHEW GAY, dean of leather manufacturers at Newark, N. J., is seriously ill at the home of his son in West Orange, N. J. Mr. Gay has been in failing health since last spring, and has now been confined for almost a month.

R. T. HASLAM has been promoted to a full professorship at the School of Chemical Engineering Practice, Massachusetts Institute of Technology, Cambridge, Mass.

F. HAZLEWOOD has recently resigned from the ceramics section of the U. S. Bureau of Standards, Washington, D. C., to accept a position with the Buffalo Pottery Co., Buffalo, N. Y.

RAYMOND A. HEINDL, formerly in charge of plant control of the National Abrasive Co., Niagara Falls, Canada, is now with the U. S. Bureau of Standards on the research staff, in connection with work in ceramics.

A. H. C. HEITMAN has resigned as general manager of Chemical Products, Ltd., Trenton, Ont., Canada, manufacturer of sulphuric acid and heavy chemicals. He was for some years a member of the research staff of Parke, Davis and Co. Before going to Trenton, he was manager of Chemical Products of Canada, Ltd., of Toronto, which produces a variety of products, heavy chemicals as well as pharmaceutical synthetics. Mr. Heitman was recently appointed a member of the chemical committee of the Honorary Advisory Council for scientific and industrial research, Canada.

RICHARD B. KAHLE has been elected president of the Invincible Oil Corporation, New York, to succeed Ernest R. Ratcliff, resigned. Mr. Kahle was formerly executive vice-president of the corporation.

B. S. ROPER, who has been head of the department of filter paper and filtering materials of H. Reese Angel & Co., Inc., for the past 5 years, has resigned his position. He can be reached at 147 25th St., Jackson Heights, Queens County, N. Y.

GEORGE R. ROLPH, general manager of the California & Hawaiian Sugar Refining Corporation, San Francisco, Calif., has left for a trip to Honolulu.

DANIEL H. RUPP, of East Liverpool, Ohio, city chemist, has been elected a member of the executive committee of the Ohio State Filtration Plant Superintendents' Association.

C. B. STAHL, secretary and treasurer of the White Hall Sewer Pipe & Stoneware Co., White Hall, Ill., has become president of the company, succeeding Gustave Bischoff, Sr., deceased. W. H. Shirley will succeed Mr. Stahl in the offices of secretary and treasurer.

Dr. JON TEPPEMA, well-known abroad for his researches in applied organic chemistry, a graduate of Leiden University, Holland, has joined the staff of the Research Laboratory of Applied Chemistry at the Masschusetts Institute of Technology.

WARREN HIRES TURNER, officer and director of the Tires Turner Glass Co., Philadelphia, Pa., has resigned, effective Dec. 1, after an association of more than 20 years. The change has been made in order that Mr. Turner may give his entire time to the Standard Plate Glass Corporation, recently organized, of which he has been elected vice-president and treasurer, with headquarters at Pittsburgh, Pa.

JOHN T. WARD, formerly assistant superintendent of the Cleveland plant of the National Carbon Co., who was graduated from Clark University, has been made an assistant professor of chemical engineering at the Massachusetts Institute of Technology, Cambridge, Mass.

On the shoulders of L. R. WILSON, until recently secretary of the Abitibi Power & Paper Co., falls the burden of running that gigantic enterprise. Alexander T. Smith of Chicago (as mentioned in *Chem. & Met.*, Nov. 26) assumes the presidency in succession to the late Frank H. Anson, but the actual executive control will be vested in Mr. Wilson.

Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, seventy-fifth anniversary meeting, University of Cincinnati, Cincinnati, Ohio, Dec. 27 to Jan. 2.

AMERICAN CERAMIC SOCIETY, Atlantic meeting, Rumford Hall, Chemists' Club, City, N. J., Feb. 4 to 9, 1924.

AMERICAN PETROLEUM INSTITUTE, fourth annual meeting, Statler Hotel, St. Louis, Mo., Dec. 11 to 13.

AMERICAN CHEMICAL SOCIETY, regular New York, Jan. 4, 1924.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, annual meeting, New York City, Jan. 22 to 25, 1924.

AMERICAN SOCIETY OF SAFETY ENGINEERS, annual meeting, New York City, Jan. 18, 1924.

AMERICAN SOCIETY FOR STEEL TREATING, winter sectional meeting, Hotel Seneca, Rochester, N. Y., Jan. 31 and Feb. 1, 1924.

CANADIAN NATIONAL CLAY PRODUCTS ASSOCIATION, Prince George Hotel, Toronto, Ont., Feb. 13 and 14, 1924.

COAL MINING INSTITUTE OF AMERICA, annual meeting, Pittsburgh, Pa., Dec. 19 to 21.

COMMON BRICK MANUFACTURERS' ASSOCIATION, Biltmore Hotel, Los Angeles, Calif., Feb. 11 to 14, 1924.

ENGINEERING INSTITUTE OF CANADA, annual general meeting, Montreal, Jan. 22, and Ottawa, Jan. 23 and 24, 1924.

FEDERATED AMERICAN ENGINEERING SOCIETIES, annual meeting, Washington, D. C., Jan. 10 and 11, 1924.

FRANKLIN INSTITUTE, annual meeting, Philadelphia, Jan. 16, 1924.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATION ENGINEERS, fourteenth annual convention, Memphis, Tenn., Dec. 12 to 16.

NEW JERSEY CLAY WORKERS' ASSOCIATION AND EASTERN SECTION AMERICAN CERAMIC SOCIETY, annual meeting, New Brunswick, N. J., Dec. 19.

SOCIETY OF AUTOMOTIVE ENGINEERS, annual meeting, simultaneously with the Detroit Automobile Show, General Motors Bldg., Detroit, Mich., Jan. 22 to 25, 1924.

SOCIETY OF CHEMICAL INDUSTRY, Perkin medal award, Rumford Hall, Chemists' Club, New York, Jan. 11, 1924.

News of the Industry

Summary of the Week

Output of lime for chemical uses increased nearly 53 per cent in 1922.

Entirely new customs law has been signed by the President of Argentina.

North Dakota interests apply to Tariff Commission for increase in duty on flaxseed and linseed oil.

Gasoline production in the United States reached the record total of 659,060,570 gal.

Appropriations for work of important government bureaus in 1924, submitted to Congress.

Several bills petition for transfer of calcium arsenate to free list on tariff schedule.

Secretary of the Interior favors formation of a division of public works.

Tariff Commission holds hearing on petition to lower duties on magnesite.

Judge Hay retires from Board of United States General Appraisers.

German-American Mixed Claims Association grants claims against Germany, amounting to $3,000,000.

Magnesite Duties in Hearing Before Tariff Commission

A hearing on applications for changes in duties on magnesite under the flexible provisions of the tariff act was held before the Tariff Commission on Dec. 5. Foreign producers who had applied for a reduction in duties did not appear at the hearing, but counsel for the Austro-American Magnesite Co. asked for an indefinite postponement of the hearing. The commission took this request under advisement, but gave opportunity to those present to state their views.

Nelson Franklin, counsel for the Northwestern Magnesite Co., opposed lowering the duty and stated that his company has only one out of five kilns in operation and despite the economical production of the plant it has been unable to sell more than one-third of the domestic requirements of dead-burned magnesite, used by steel plants and foundries. Imports this year, he said, totaled 45,000 tons, while the Northwestern Magnesite Co., the heaviest domestic producer of dead-burned material, had sold only 22,000 tons because it had been undersold by Austrian producers.

Stanley H. Barrows, of the Sierra Magnesite Co., questioned the prices given for calcined magnesite and stated that the figures used referred to 1915-1919.

George W. Selby, representing the Magnesite Cement Building Products Association, asked for the maximum decrease of 50 per cent in rate of duty. Henry A. Golwynne also spoke in favor of lower tariffs. He stated that he had imported 59 per cent of the caustic calcined magnesite which had reached this country during the present year. Mr. Golwynne stated that crude magnesite cannot be profitably imported under the existing duty. On this account he imports only caustic magnesite and is the sole representative of Indian producers. He used government records in compiling statistics of imports, prices, consumption, etc., which he presented at the hearing.

Bills Favor Turning Muscle Shoals Over to Ford

The new Congress had not perfected its orginazation when bills for the disposal of the government's properties at Muscle Shoals were tossed into the hopper of the House. All of the several early measures provided for lease of the projects to Henry Ford.

Representative J. C. McKenzie of of Illinois reintroduced without change the bill agreed upon in the last Congress by a majority of the members of the House Military Affairs Committee. This provides for acceptance of the Ford offer for the hydro-electric development, the nitrate plants, quarry, railroad and other properties on the terms of the Ford bid, but excludes the Gorgas steam plant. It was exclusion of this plant which caused several bills to come up in the last Congress.

Representatives Vinson of Georgia and Almon of Alabama introduced bills accepting the Ford offer without change. These bills evidently would make it incumbent upon the government to build a new steam plant on the Warrior River with a transmission line to Muscle Shoals.

Representative Martin Madden of Illinois introduced a bill to dispose of the Muscle Shoals properties to Henry Ford which provided that the government build a steam power plant on Black Warrior River near Lock No. 17 and construct a transmission line to Muscle Shoals to replace the Gorgas plant and transmission line sold to the Alabama Power Co.

Free Entry for Calcium Arsenate Proposed to Congress

Several bills to amend the tariff act by transferring calcium arsenate from the dutiable list to the free list were introduced in the first few days of the Sixty-eighth Congress.

Members of Congress from the South met Nov. 30 and Dec. 1 to consider concerted action on legislation of interest to cotton planters. Among other resolutions adopted was one proposing that calcium arsenate be placed on the free list and that pending this action application be made to the Tariff Commission for a reduction of 50 per cent in the present duty of 25 per cent ad valorem on this boll weevil poison. Representatives Collier of Mississippi, chairman, Parks of Arkansas and Stevenson of South Carolina were named a committee to draft legislation to this end and to appeal under the provisions of the flexible tariff.

A committee composed of Representative Bankhead of Alabama, chairman, Senator Sheppard of Texas, and Representatives Hastings of Oklahoma, Aswell of Louisiana and Vinson of Georgia were named a committee to consult with the Shipping Board and the Interstate Commerce Commission regarding lower freight rates for arsenate.

Dr. G. F. Loughlin, of the Geological Survey, and Dr. A. Stewart, of the Bureau of Mines, explained the arsenic and calcium arsenate situation to the conference, which was attended by fifty-two Representatives and seven Senators. They were of the opinion that production of arsenic would be increased materially if the demand were stabilized and producers were assured of minimum sales at a reasonable price. Dr. Loughlin stated that reports indicated consumption of 32,000,000 lb. of calcium arsenate this season.

Proposed Budgets for Government Departments Before Congress

Plans of Bureaus for Next Year Shown by Allotment of Expenditures —Appropriations Sought to Continue Work on Same Scale as in Current Year

AMONG the recommendations submitted to the new Congress were appropriations for carrying on the work of different departments of the government in the coming year.

The budget for the Bureau of Chemistry carries a total of $1,406,875. The principal subdivisions of that amount are: Salaries, $340,000; investigations relating to the application of chemistry to agriculture, biological investigations of food and drug products, $120,600; collaboration with other departments desiring chemical investigations, $14,090; investigation and experimentation in the utilization of raw materials for coloring, medicinal and technical purposes, $55,805; investigation and development of methods for the manufacture of table sirup, $28,370; to carry into effect the provisions of the food and drugs act, $716,260; to carry into effect the provisions of the pure tea act, $36,110; for investigating the grading, weighing, handling, transportation and uses of naval stores, $10,600; for investigation and development of methods of manufacturing insecticides and fungicides and for investigating chemical problems relating to the composition, action and application of insecticides and fungicides, $29,440; for the investigation and development of methods for the prevention of grain dust and other plant dust explosions, $26,555; to carry into effect the provisions of the naval stores standardization act, $10,000; general expenses, $1,066,875.

If Congress allows the full amount asked, it will enable the bureau to continue its work on practically the same scale as is being done during the current fiscal year, for which $1,320,031 was actually appropriated.

Increase for Commerce Department

The budget carries $24,048,025 for the Department of Commerce. This is an increase of nearly $3,000,000 over the amount appropriated for the work of the current fiscal year. The total carried in the budget for the Bureau of Foreign and Domestic Commerce is $3,165,372. This is an increase of more than $1,000,000 over the amount appropriated for the work of the current fiscal year.

For the investigation of essential raw materials, which include nitrate of soda and other chemical products, $125,000 is provided. An expansion of the compilation of foreign trade statistics is contemplated in the recommendation that $300,000 be expended for that purpose. During the current fiscal year $220,000 will be expended for that work. This includes $150,000 transferred from the Treasury Department appropriations when the Department of Commerce took over the activities of the New York statistical office. An increase of $5,000 is asked for the investigation of restrictions and regulations imposed by foreign countries on trade. This brings the total to $30,000.

To enable the department to collect and disseminate information regarding elimination of waste, and the introduction of economies in the distribution of raw materials and manufactured products in domestic trade, $75,000 is asked. This is an increase of $25,000 over the current appropriation.

Expansion for Commodity Divisions

To permit of an expansion of the work being conducted by the commodity divisions, $680,000 is asked. This is $130,000 more than the currernt appropriation. An increase of $90,000 is asked to continue the work of promoting and developing commerce in the Far East. This brings the total to $290,000. A similar amount is asked in connection with the promotion and development of Latin-American commerce. A total of $425,000, an increase of $45,900, is asked in connection with the promotion of the European commerce. The sum of $346,375 is carried in the budget for commercial attachés. This is an increase of $121,375 over the amount now being expended.

Bureau of Standards Allotted $1,809,680

The budget carries $1,809,680 for the Bureau of Standards. This represents an increase of some $250,000 over the current appropriation. Industrial research, looking to the establishment of new American industries, will receive $180,000 for next year's work, if the budget recommendation is approved by Congress. This is an increase of $30,000 over the current appropriation. The amount provided for the high-temperature investigation is $10,000, the amount appropriated for this year's work. A total of $44,000 is asked for metallurgical research, an increase of $4,000 over this year's appropriation. This includes work on alloy steels, aluminum alloys, corrosion and the investigation of material used in railway equipment. No increase is recommended for the work on sugar standardization. That item remains at $40,000. A slight increase is asked in connection with the investigation of textiles, paper, leather and rubber. The budget carries $27,000 for those purposes. No increase is asked for the work on optical glass. That item remains at $25,000. The same is true of the $30,000 item for the investigation of clay products. The color standardization item remains at $10,000. A total of $45,260 is asked for the testing of varnishes, soaps, inks and chemicals. This is an increase of $5,260 over the current appropriation.

English Contracts for Davison Chemical Co.

C. V. Miller, president of the Davison Chemical Co., issued the following statement last week:

"My trip to Europe was most satisfactory in every respect, with the result that we have closed more contracts in England than we have made here. I regret very much to find upon my return that speculators had used rumors regarding silica gel for the purpose of manipulating the price of Davison Chemical shares. In my last two annual reports I expressed my confidence in the future of silica gel and gave the stockholders definite information regarding the progress we made.

"It has been of great gratification to all of us that our developments this year have resulted in even greater achievements than we anticipated. The silica gel process is an established fact and there is no mystery about it. It will not be the policy of the management of our company to embarrass our customers by advertising whenever contracts with us have been made or are pending. I wish to say most emphatically that none of the officers of the company has ever been interested in manipulating in stocks."

New Pulp Mill for Prince Rupert, B. C.

The Prince Rupert Sulphite Fibre Co., Ltd., which was organized recently to take over the Emerson sawmill and timber limits in the vicinity of Prince Rupert, has had plans prepared for a 90-ton bleached sulphite pulp mill and the machinery for the plant has been ordered. It is expected that it will be 7 or 8 months before the machinery, much of which has been ordered in Europe, will arrive, and in the meantime the work of constructing eight reinforced concrete buildings to house the plant will go ahead, so that they may be ready for the machinery when it arrives.

Judge Hay Retires From Board of Appraisers

It was announced last week that Eugene G. Hay had retired from the Board of United States General Appraisers. Judge Hay was a member of Board No. 3 and in his 20 years of active work on the board, he was called upon to make rulings of great importance to importers. He retires under act of Congress permitting federal judges to retire with full pay at the age of 70.

Fertilizers Used in Barbados

As the wealth of Barbados depends almost entirely upon agriculture, fertilizers are used to a large extent. All are imported, none being manufactured on the island. The largest importer of fertilizers reported the average quantities received per year as follows: Sulphate of ammonia, 4,500 tons; sulphate of potash, 400; nitrate of potash, 300; nitrate of soda, 150; organic nitrogen, 300; and sheep manure, 5,000 to 6,000.

Washington News

President Coolidge on Muscle Shoals and Fertilizer

President Coolidge's opening message to Congress, delayed by the contest over organization in the House of Representatives, was delivered on Thursday. It contained this reference to Muscle Shoals:

"The government is undertaking to develop a great water-power project known as Muscle Shoals, on which it has expended many million dollars. The work is still going on. Subject to the right to retake in time of war, I recommend that this property with a location for auxiliary steam plant and rights-of-way be sold. This would end the present burden of expense and should return to the Treasury the largest price possible to secure.

"While the price is an important element, there is another consideration even more compelling. The agriculture of the nation needs a greater supply and lower cost of fertilizer. This is now imported in large quantities. The best information I can secure indicates that present methods of power production would not be able profitably to meet the price at which these imports can be sold. To obtain a supply from this water power would require long and costly experimentation to perfect a process for cheap production. Otherwise our purpose would fail completely. It seems desirable, therefore, in order to protect and promote the public welfare, to have adequate covenants that such experimentation be made and carried on to success. The great advantage of low-priced nitrates must be secured for the direct benefit of the farmers and the indirect benefit of the public in time of peace and of the government in time of war. If this main object be accomplished, the amount of money received for the property is not a primary or major consideration.

"Such a solution will involve complicated negotiations, and there is no authority for that purpose. I therefore recommend that the Congress appoint a small joint committee to consider offers, conduct negotiations and report definite recommendations."

Commission Grants Large Claims Against Germany

As a result of joint investigations carried on in Germany several months ago by the German-American Mixed Claims Commission, fourteen claims against Germany were granted last week. These claims amounted to approximately $3,000,000, to which will be added interest.

The largest amount was awarded to the United Shoe Machinery Co. of Boston, Mass., which won two claims totaling $1,800,000. Other large claims included $700,000 to the Security Eyelet Co. and $140,000 to the Roessler & Hasslacher Chemical Co., Samuel Weiss $50,000, Thomas G. Barman $250, Joe Allard $6,000, Henry Farlow $1,000, Henry Mirski $1,250, the Chicago Ferro-Type Company $1,000, William V. Kelley $26,100, the American Pulley Co. $895, the Foos Gas Engine Co. $4,724, and the Sterling Varnish Co. $4,020.

Western Interests Ask for Higher Duty on Flaxseed

Agricultural interests in the Northwest, represented by Senator Ladd and Representative Young of North Dakota, have applied for an increase in duty on flaxseed, under the flexible provisions of the tariff act. The present duty on flaxseed or linseed is 40c. per bu. and the formal application of these Western interests petitions for the full maximum of 50 per cent increase in duty allowable under the tariff law. A corresponding increase in the duty on linseed oil also is included in this application. In addition to making this application to the Tariff Commission it is stated that efforts also will be made at the present session of Congress to amend the McCumber-Fordney tariff act so as to include higher duties on flaxseed and linseed oil.

Investigate Food Value of Mesquite Bean

Great quantities of mesquite beans are allowed to go to waste each year in the United States. In an effort to promote their utilization the Bureau of Chemistry undertook an investigation to determine whether or not these beans might be made to serve some useful purpose.

The literature was searched for data on the nutritive value of the mesquite fruit. Samples were analyzed in the laboratory to determine the content of sugar and other crude nutrients, and a process for separating the mesquite bean into its component parts was devised. The results of this work, supplemented by notes on carob and honey locust beans, are given in Department Bulletin 1194.

Large Camphor Refinery Being Built in Hongkong

According to a report from Consul William J. McCafferty, the camphor refinery belonging to A. S. Watson & Co., in Hongkong, which was wrecked by a heavy typhoon last August, will be replaced by a much larger plant.

The new plant will have a capacity of approximately 10 tons of high-grade refined camphor per month. It is the intention to specialize on camphor in tablet form, the tablets to vary from one-eighth of an ounce to 2 ounces in weight, and the camphor will have a purity of from 99 to 99.5 per cent. New machinery has been added to the plant to facilitate the manufacture of the tablets and to simplify the refining process, and it is hoped that this new factory will be in full operation by next January.

Reduction and Carburization in Iron Smelting

Observations made in experimental work on sponge iron and synthetic cast iron, performed by the Department of the Interior at the Seattle station of the Bureau of Mines, led to certain conclusions regarding reduction and carburization that differ in some respects from prevalent belief. These findings are being further studied. As a result of this work it would seem that it may be possible to produce low-carbon iron from the blast furnace. In order to obtain exact data on the combination of carbon with iron, reduction tests are being carried on with molten iron in contact with solid carbon and with gases. In the course of this work, it was found that gases (methane, acetylene or carbon monoxide) were valueless for introducing carbon into molten iron, but solid carbon dissolved rapidly.

Leach Caved Mine Areas at Bingham Canyon, Utah

At copper mines, many old dumps, stope fillings and similar accumulations of low-grade copper-bearing material, formerly regarded as waste, may now under proper conditions be leached in place, states the Department of the Interior. A large copper company is now leaching its old caved areas successfully. Its officials have been given all the encouragement and assistance the Bureau of Mines could fittingly render; they have become convinced of the necessity for close technical control of their solutions to prevent loss, and are giving the bureau facilities for studying the beginning of what appears to be an important means of saving low-grade values.

New Customs Law for the Argentine

An entire new customs law has been signed by the President of Argentina, according to word received last week by the Department of Commerce. In this law many changes are made from the original bill, with increases in some instances, decreases in others, while some articles are accorded free entry. This law will be effective 24 hours after its publication, which, it is expected, will be within a few days.

Tariff Investigation Includes Pre-war Imports and Prices

An investigation of prices of exports and imports from before the World War to the present has been undertaken by the Tariff Commission, according to its annual report to Congress. This is being done in order to determine the influence of import duties on competition and the effect of particular duties upon international commercial relations.

Institute of Chemical Engineers Holds Enthusiastic Meeting in Washington

Large Attendance of Members Who Grasp With Keen Interest an Excellent Opportunity to Increase Acquaintance With Work of Government Bureaus

THE sixteenth annual meeting of the American Institute of Chemical Engineers was held at the New Willard Hotel in Washington, Dec. 5 to 7. It is an unnecessary comment to say that the meeting was enthusiastic. The number of the members and guests attending and their keen interest in the general subject of the meeting attest to this.

The meeting itself had for its primary purpose the increasing and broadening of the acquaintance of the Chemical Engineers with the constructive work of the government bureaus in the application of science to industry. Most of the papers presented at the meeting dealt with some phase of the government's activities in the field of technical research and the supplementary visits to the government departments and laboratories served to make visual the scope of this work. The Bureau of Mines, the Bureau of Standards, the bureaus of the Department of Agriculture, including the Bureau of Chemistry, the Bureau of Soils and the Fixed Nitrogen Research Laboratory, were selected as being most intimately associated with the work of the chemical engineer.

A full discussion of the technical program will appear in next week's issue.

Hear President's Speech

One of the stimulating features of the meeting was the opportunity of listening to the President's message from a radio loud-speaker at the Bureau of Standards. The technical session which was in progress at the time stopped for an hour while the President was talking. The reproduction was magnificent and the address will be a memorable and thrilling recollection of the Washington meeting. The enthusiasm of the members for the President's message was great and was openly expressed.

This being the annual meeting of the Institute, officers for the coming year were elected by counting the ballots mailed in by the members. Dr. Charles L. Reese, chemical director of the du Pont company, was elected president to succeed President Henry Howard, who has just completed his second term. H. K. Moore, of the Brown Co., Berlin, N. H., automatically became first vice-president and Dr. H. S. Miner, of the Wellsbach Co., became second vice-president. The office of third vice-president is filled by election and Prof. A. H. White. of the University of Michigan, was chosen for this office. Other officers were elected as follows: J. C. Olsen, secretary; F. W. Frerichs, treasurer; David Wesson, auditor; W. L. Badger, F. A. Lidbury and A. E. Marshall, directors.

The next meeting of the Institute, as already announced, will be held at Denver, Colo., on July 15 to 18, 1924. The days selected will make it possible for men to leave the East at the end of a week and be absent from their business only one week. July has been selected instead of June as a time for the meeting because the weather is more clement at that season in the high mountains. The next winter meeting place was discussed and it was decided to accept the invitation of the members at Pittsburgh to hold the meeting there.

Committees Report

A number of important items were brought out in the committee reports, many of which will be of great interest to Institute members. The publication committee brought out the fact that all of the transactions of the Institute had been published up to the papers presented at the Wilmington meeting last June. The type for these papers is ready and it is the hope of the committee that not only this volume but the volume which will include the papers from the Washington meeting will be ready before the first of June. Fred C. Zeisberg, of the du Pont company, pointed out that this progress had been made possible because the 60-day rule that makes it compulsory to submit a paper 2 months before the date of the meeting had been largely enforced. The subject of an index for the first fifteen volumes of the *Transactions* of the American Institute of Chemical Engineers was discussed fully and the publication committee was authorized to proceed with the publication of such an index. It will be constructed along progressive chemical engineering lines and classified according to the unit processes of chemical engineering.

The Institute had the opportunity of listening to its new honorary member, W. H. Nichols, and then sent a telegram of greeting to its first and only other honorary member, Charles F. Chandler, on the occasion of his eighty-seventh birthday.

Streamline Filter Shown at Power Show

Exhibition Is Held Simultaneously With the Annual Meeting of the A.S.M.E.

The second annual National Exposition of Power and Mechanical Engineering was held at Grand Central Palace, New York City, Dec. 3 to 8, 1923. Although this exhibit is primarily held for mechanical engineers and for that reason occurs at the same time as the annual convention of the mechanical engineers' society, it is of unfailing interest to all those who use power, and that means nearly everyone in industry.

The show was a bit more extensive this year than last and was certainly better attended. There were 259 exhibitors, which is a fine showing, but one missed such large concerns as G. E. Co., Westinghouse, and B. & W., which, by the way, calls to mind the fact that the electrical side of the power industry was, on the whole, rather poorly represented.

The most important exhibit at the show, from the standpoint of the chemical engineer, was Dr. Hele-Shaw's Edge Filter, exhibited by the Streamline Filter Corporation. This device, which apparently aroused much interest at the recent Olympia Show in London, is exhibited in laboratory and small commercial sizes. It is shown working on several different liquids—purifying dirty lubricating oil, removing color from an ink-and-water solution, removing cloudy appearance from dirty water and other similar uses. Engineres in the United States are glad to see this device in action and much interest was shown in it at the show. One of the features of the show was the large number of electrically operated gate valves that were exhibited. Nearly every valve company had such equipment to show and the interest evinced therein by the visitors was great. Apparently, this extremely logical piece of labor-saving equipment is at last to receive the attention it deserves.

The trend in combustion practice and fuel selection is clearly shown by the exhibits. Oil burners, particularly of the "mechanical" type, and pulverized coal apparatus were conspicuous in all parts of the Palace. This trend away from the ordinary type of coal-firing, well marked in general industry, is evidently reaching prominence in the power generating field.

Many Recorders on View

Another feature, evident at all the recent industrial shows, was the large display of greatly improved indicating and recording instruments for control purposes. As the benefits to be derived from such control are being more and more realized by the engineering public, so the companies that supply such equipment are producing ever better means of maintaining this control.

The great attention attracters this year were the various exhibits of manufacturers of ball bearings. Marvelous ingenuity had been brought to bear in the design of apparatus to cause the little steel balls to bounce and the famous Mexican "jumping bean" was being outdone on all sides—much to the edification of the small boy, not to mention his dad.

Official Prices for Turpentine Resumed in France

Practice Abandoned During War Revived Last Summer—Review of French Naval Stores Industry

PRACTICALLY the total French output of naval stores is produced in the consular district of Bordeaux and about 75 per cent of the total exports of these commodities from France is shipped from the port of Bordeaux. This information is contained in a report made by Consul Lucien Memminger at Bordeaux.

In normal years France furnishes about one-sixth of the world's production of naval stores, whereas the United States produces about four times as much. Of the total French production of 32,000 metric tons of turpentine in 1922, 9,104 tons was exported, and in the same year slightly less than 50 per cent of the French output of 118,000 tons of rosins was sent to foreign countries, principally Germany, England, Belgium, Italy and Holland. The average price per metric quintal of turpentine in 1922, as quoted at Dax, the center of production, was 438 francs, and of pitches 60 francs—considerably higher than the averages in 1921, when prices were very low, but less than the exceptionally high averages attained in 1920—namely, 617 francs for turpentine and 170 francs for pitches.

According to the publication *Bois et Résineux*, the following prices per metric quintal of 220.46 lb. were quoted at the Bordeaux Bourse during the first semester of 1923:

Session	Turpentine, Francs	Pitch, Francs
Jan. 1	665	75
Feb. 5	680	82
Mar. 5	785	110
Apr. 2	745	97
May 7	480	78
June 4	555	86
June 25	550	93

Under authorization of the French Government the practice, abandoned during the war, of proclaiming official market prices for turpentine has lately been resumed. The governmental commission's first declaration of price at the Bordeaux Bourse was on July 23 and at Dax on Aug. 4. The establishment of this system is considered by those engaged in the trade in Bordeaux to be an important improvement.

Regulations for Fixing Prices

A commission representing the manufacturers, dealers, and consumers of the French output of resinous products presented to the French Ministry of Commerce a draft of the regulations under which the prices were to be fixed. The following is a translation of those regulations as adopted:

1. There shall be established an official market price for spirits of turpentine on the markets of Bordeaux and of Dax, the prices being declared each Monday and Wednesday at Bordeaux and on Saturday at Dax.

2. The official price shall be fixed at the end of each market day by a commission appointed by the president of the Chamber of Commerce, and the chairman shall be a member of the Chamber of Commerce who is not a manufacturer of resinous products. The members of the commission shall be, on the one hand, one producer and one dealer in resinous products, selected by the interested groups, and, on the other hand, brokers duly attested by the commercial court who specialize in the trade in resinous products. In case of dispute the decision shall be by a majority vote, the vote of the chairman deciding in case of a tie. In the absence of the permanent chairman or of delegates of the groups of producers and dealers, the absentees shall be replaced by the substitutes designated for that purpose, the first named by the president of the Chamber of Commerce, the second by the interested associations.

When Official Price Will Be Fixed

3. An official price will be proclaimed only when a minimum quantity of 24,000 kilos of spirits of turpentine has been dealt in on the market. In calculating this minimum of 24,000 kilos there shall be reckoned only transactions representing a minimum of 2,000 kilos.

When the commission to fix the price finds that the transactions amount to less than a total of 24,000 kilos, they will reaffirm the previous market price and will indicate the prevailing tendency.

The price will be established for spirits of turpentine (raw, of French production, sound quality, and marketable) at 100 kilos at point of departure in the Landes, per 10,000 kilos minimum, or parity for sales of less than that figure, payment on account without discount.

For each market session there shall be indicated the average price per 100 kilos, taking account of all the operations of 2,000 kilos or more declared to the commission and dividing the total of all the operations by the quantities recorded; also the commission shall declare the lowest and the highest price realized for sales amounting to at least 2,000 kilos. and the prevailing tendency.

In the second semester of 1923 the Bordeaux market remained fairly firm but was not particularly active, especially as regards exports. The official price of 500 francs for turpentine and 84 francs for pitches was declared at Bordeaux on July 23, about the same as at Dax on that date. Stock of spirits of turpentine in the octroi warehouses at Bordeaux, which amounted to 542,076 kilos on July 31, had increased to 1,763,016 kilos on Aug. 31.

The average prices during the month of September at Dax were: Turpentine, 486.25 francs, and pitches, 81.15 francs; and on Oct. 13, turpentine, 493 francs, and pitches, 79, which also approximated the prices at Bordeaux.

Proposed Budget for Chemical Warfare Service

An appropriation of $720,760 for the work of the Chemical Warfare Service during the next fiscal year is recommended by the President and the Director of the Budget, in the report submitted to the new Congress. The amount actually appropriated for the Chemical Warfare Service for use during the current fiscal year was $717,240. It is expected that Congress will approve the amount contained in the budget, thereby making possible the continuance of the work on the present scale. The major subdivisions of the amount it is proposed to spend during the next fiscal year are as follows: Scientific and educational supplies, $12,500; fuel, $85,000; machinery and equipment, $8,300; buildings, $8,300; non-structural improvements, $8,300; scientific equipment, $3,500; furniture and fixtures, $1,250; transportation equipment, $5,000; salaries, office of the chief of the Service, $20,760.

Record Production of Gasoline in October

Production of gasoline in the United States in October amounted to 659,060,570 gal., constituting a new monthly record, according to statistics compiled by the Bureau of Mines. Notwithstanding this record production, gasoline stocks on hand at refineries Nov. 1 amounted to but 946,872,683 gal., a decrease of 25,832,149 gal., as compared with Oct. 1.

Gasoline in storage Nov. 1 amounted to 41.6 days supply at the October rate of demand. In comparison with the situation on Nov. 1, 1922, the Bureau of Mines current figures show an increase of 20 per cent in the new supply of gasoline, an increase of 32 per cent in the total demand, and an increase of 31 per cent in the refinery stocks taken on the gallonage basis. The statistics indicate a substantial improvement in the gasoline situation from the refiners' point of view. The surplus stocks have been reduced to normal, taking into consideration the increases in supply and demand. Both foreign and domestic demand are holding up well for this time of the year, and the total demand is in excess of the new supply.

Imports of gasoline during October were 20,001,431 gal. Domestic demand for gasoline amounted to 617,699,699 gal., a decrease of nearly 6 per cent from September. Exports (including shipments to Alaska, Hawaii and Porto Rico) were 87,194,451 gal. The total demand (domestic demand plus exports) shows a decrease of nearly 7 per cent from the September figures. The new supply was only 96 per cent of the total demand, withdrawals from storage constituting the remainder.

Loss of Skilled Workers Felt in Restoring Japanese Industries

Japanese Government Will Give Financial Aid in Rebuilding Factories—Many Chemical Plants Completely Destroyed

THE earthquake inflicted appalling losses upon Japan's chemical industries, according to Tokio advices to the American Chemical Society. Industrial recovery, it was said, will be difficult owing to the killing and scattering of workers. Replacement of expert labor was described as one of the most baffling problems confronting Japan.

The commercial and industrial districts of Tokio and almost the whole of Yokohama were destroyed by fire, according to the report. In the Honjyo and Fukagawa districts many chemical factories were almost completely destroyed. There were about 1,100 factories in the two districts, employing about 70,000 persons.

In the Fukagawa District was located the Asano Cement Co., the products of which are well known among the cement users. The remaining factories are situated in the suburbs of the city, where the damage was comparatively small. The total number of factories in the Tokio Prefecture was about 25,125, employing 152,906 male and 72,391 female workers; 10,913 factories were destroyed and 78,207 persons lost their positions. The total damage of the factories is estimated to be about 30 to 40 per cent.

Government to Lend Money

The important factories situated outside the burned districts can begin work after 2 to 6 months. However, the recovery of these factories is not easy; they must build new buildings and gather workmen, machines and raw materials. As far as they have money, factories, machines and raw materials will be obtained, but the expert workmen cannot be obtained with money. The government intends to lend money for recovering these totally or partly destroyed factories at low interest through the Industrial Bank of Japan or the agricultural and industrial banks.

Subworkers Killed or Scattered

There were many male and female subworkers who were making important contributions to general industry. For example, the labeling of match boxes was conducted by subworkers. The catastrophe has killed many of these and scattered the others into the country. This will greatly hinder the recovery of many of the factories.

Raw and finished cast-iron materials needed in Tokio factories have been supplied from about two hundred factories in Kawaguchi-machi, near Tokio. About 50 per cent of these were affected by the disaster and their recovery is now under consideration in the Agricultural and Commercial Department.

The special committee of the government is now planning the erection of "New Tokio." As soon as the plans are completed new factories will be built and these districts will continue to be factory districts.

Workers Stripped of Everything

The chief damage sustained from the calamity viewed from the standpoint of capitalists is the loss of raw materials and finished products, but this can be replaced by money. The workers, however, being stripped of everything, cannot work at their trades, for they have no factories. They are forced to seek work of whatever kind there is to be found.

Like other chemical industries, the dyestuff industry in Japan has made rapid progress since the war. The Nippon Senryo Kaisha in Osaka, subsidized with 10,000,000 yen by the government, has grown to be the largest and most representative.

With the aid of this government money, the manufacturing processes of the following substances have been completed; 158 kinds of aniline dyes, 148 kinds of intermediates and 14 assistant reagent, medicine, etc.; of which 45 aniline dyes, 59 intermediates, and 21 assistants, etc., have been placed on the market. The annual manufacturing capacity is 2,200,000 kin of aniline dyes, including aniline salt, while the annual consumption of analine dyes is about 4,700,000 kin.

Switzerland an Importer of Soap

Soaps and washing powders of all kinds find a ready market in Switzerland. It is difficult to estimate the percentage of the total consumption that is of foreign manufacture, but it is safe to say that a considerable portion of the quantity used is imported. While there are something like forty soap factories in Switzerland, only twelve or fifteen of them can be considered of much importance, and it is necessary to import about 9,000,000 francs worth of soap per annum. Switzerland exports soap to about one-third the value of the imported soap. This information is given in a report from Calvin M. Hitch, consul at Basel.

Soaps are divided into three classes for customs purposes: Ordinary soaps intended for industrial uses, not pressed or shaped and packed in cases or barrels, on which the duty is 10 francs per 100 kilos gross weight; ordinary soaps not intended for industrial uses, on which the duty is 20 francs per 100 kilos gross weight; and all other kinds, including toilet soaps, whether perfumed or not, in tablets or powders, on which the duty is 90 francs per 100 kilos gross weight. Under the Swiss customs regulations duties are charged on the gross weight, and it is important, therefore, to have goods for this market packed as lightly as possible, but in sufficiently strong containers to prevent damage in transit.

Soap for industrial purposes is used largely in dyeing plants, of which there are four near Basel, and their annual consumption of soap is several hundred tons. Heretofore the greater portion has been supplied by local manufacturers, but during the year 63 metric tons have been imported. Of this quantity 48 tons came from Germany, 10 tons from the United States, and the other 5 tons were divided between France and England.

Secretary of Interior Favors Department of Public Works

The Secretary of the Interior states that he is ready and anxious to cooperate in the effort looking to the establishment of a major division of public works in his department. Secretary Work expressed this determination last week to L. W. Wallace, the executive secretary of the Federated American Engineering Societies, whom he called into special conference on this subject.

Secretary Work told Mr. Wallace that he is in entire sympathy with the Brown plan for reorganizing the Department of the Interior. That plan provides for the division of the department into two major branches, one to deal with public works and the other with matters of the public domain. The public works branch is to be under the immediate direction of an assistant secretary, who is to be an engineer. Secretary Work went so far as to suggest to Mr. Wallace that the engineers begin thinking of a man who would be qualified to fill that position.

In his conversation with Mr. Wallace, Secretary Work made the point that it would be wise to provide for the use of army engineers in connection with the public works program. He expressed the opinion that Congress would not approve of the plan unless this were done.

Chemical Use of Lime Increased in 1922

The output of lime sold for chemical uses increased nearly 53 per cent in 1922, after a decrease of 48 per cent in 1921. The increase was shown by lime for all the principal chemical uses except tanneries. Dead-burned dolomite made the most remarkable increase—224 per cent. Furnaces and smelters that use this product resumed operations during 1922, and all the states supplying these plants showed marked increase in sales. Dead-burned dolomite is produced at Ensley, Ala.; Natural Bridge, N. Y., Peebles (Kenova, W. Va.), Maple Grove, and Beltsville, Ohio; Bainbridge, Plymouth Meeting, and Saginaw, Pa.; and Millville, W. Va. Furnaces and smelters also buy the raw dolomite for use as a refractory material, as may be noted in the report on limestone.

Southern Universities Add New Chemistry Buildings

Notable expansion is taking place in the central South in the line of chemistry buildings and chemical laboraties, and three projects of appreciable size are now maturing. Foremost is the new hall of chemistry to be erected at the University of West Virginia, Morgantown, to be 4-story and basement, 79x305 ft., with 1-story and basement extension; it will be of fireproof construction throughout, with exterior of face brick, trimmed with Indiana limestone. The new building will cost about $400,000, and bids for erection are being received by the State Board of Control, James S. Lakin, president, Charleston, until Dec. 28. Paul A. Davis, 3d, & Dunlap, 1713 Sansome St., Philadelphia, Pa., are architects.

The Washington and Lee University, Lexington, Va., Henry L. Smith, president, is completing plans and will take bids within the next fortnight for the erection of a 3-story and basement chemical laboratory, 100x136 ft. It will be of brick and hollow tile, with concrete floors, estimated to cost approximately $150,000. Flournoy & Flournoy, Washington, D. C., are architects.

The University of North Carolina, Chapel Hill, has authorized plans for a new chemistry building at the institution, for which an appropriation of about $400,000 will be available. A site has been selected near the southwest corner of the campus and it is expected to determine details of size, material, etc., as well as the equipment installation, at an early date. Atwood & Nash, architects, care of the university, have been selected to prepare plans and specifications.

To Extract Rubber From Guayule in Mexico

A report from Mexico states that the State of Zacatecas has signed a contract with the Continental Rubber Co. of New York for the construction in that state of a plant for the extraction of rubber from the guayule plant.

Prior to the revolution in 1916, the Carnahan interests were gathering guayule from 2,000,000 hectares of land in the states of Coahuila, Durango, Nuevo Leon, Tamaulipas, San Luis Potosi and Chihuahua and had a number of plants scattered throughout these states, with headquarters in Torreon. Operations ceased entirely in 1916, and only within the past 3 years has any attempt been made to resume operations. It is estimated that there are 130,000 square miles of lands producing wild guayule in Mexico, with the greater part in Chihuahua desert.

At the present cost of operations and production it is calculated that rubber can be extracted from the plant, shipped to New York, and sold at a cost ranging from 20 to 25 centavos a pound, including all expenses, taxes, etc., but excluding royalties for the use of certain extraction processes.

News in Brief

Following the recent shutdown of the plant of the Tuscora Rubber Co., Dover, Ohio, throwing about 150 employees out of work, the District Court has authorized the sale of the plant and equipment by Victor J. Robinson, receiver. A plan to reorganize the company has been unsuccessful.

An explosion was caused by water coming in contact with hot metal in the chemical department of Ferro-Alloys Steel Co. at Niagara Falls, N. Y., on Nov. 29. Two employees were injured and the roof of the building was blown off.

Fire destroyed the retort house of the Otto Chemical Co., at Sergeant, Pa., 3 miles from Kane, last Monday morning. The loss is estimated at $15,000. The building was a wooden structure covered with sheet iron. Two retorts were destroyed as well as a quantity of methanol and acetate of lime.

An open meeting of the Chemical Society of Union College, at Schenectady, N. Y., was held last week in the auditorium of the Butterfield Memorial Laboratory, at which S. H. Friestadt spoke on "The Application of Chemistry to the Manufacture of Leather." Mr. Freistadt is employed as a chemist by the firm of Wood & Hyde, manufacturers of leather, at Gloversville. The next open meeting of the society will be held in December. At that time it is expected that Douglas Small and Charles Pitts will give the results of some individual research they have been carrying on during the year.

A woolen products laboratory which will deal exclusively with the technical problems of their industry is to be equipped and maintained in Toronto by the Canadian Woolen Manufacturers' Association. The preliminary steps have already been taken and a chemist is at present studying the manufacture of woolen products in one of the large Ontario mills.

A new pulp mill for the Great Lakes Pulp & Paper Co. is under construction at Fort William, Ont. The work has proceeded rapidly and is much more advanced than it was expected to be at this date.

A new vaseline and byproducts manufacturing plant of the Chesbrough Manufacturing Co. started operations in Pittsburgh, Dec. 1, with 100 employees.

A large petroleum refining plant has recently been completed at San Pedro, Los Angeles harbor, to be operated by a subsidiary of the Pan-American Petroleum & Transport Co., now being organized under the name of the Pan-American Western Petroleum Co., to take over the Pan-American Petroleum Co. The parent company is disposing of a bond issue of $12,000,000, of which about $5,000,000 will be used by the new California subsidiary, including proposed extensions in facilities and equipment.

Bauxite has been found in paying quantities on the farm of W. H. Jones, 10 miles from Eufaula, Ala., and the Republic Mining Co. of St. Louis, Mo., has leased these lands and opened up a mine. It is estimated that on 140 acres of these lands there is approximately 1,000,000 tons of bauxite.

Prevention of oil pollution of waters is the purpose of a device invented by W. H. Mencke, engineer of the Standard Oil Co. of New Jersey, and to be used by the company aboard its oil tankers. It is held that the apparatus will remove oil impurities from bilge water, the operation being to add one part of fuel oil to nine parts of bilge water, thus producing a heavier oil mixture than normal, the device separating the oil from the water and preventing it from being pumped into the sea. Tests have been made on the company tanker, "Charles Pratt," in New York Bay, and the results are to be presented before the international conference of maritime nations on the question of the pollution of coastal waters.

The manufacture of rubber articles, such as playballs, druggists' sundries, etc., is expected to commence early in January in Sherbrooke, Que., in the factory of the Paramount Rubber Consolidated. This is a Canadian firm affiliated with a New Jersey concern of the same name. It will make a number of articles that have never before been made in Canada.

Trade Notes

The Southern Chemical Co. has been formed at Monroe, La., and will manufacture calcium arsenate.

A. C. Thompson is now connected with Vietor & Hoskin and will have charge of the arsenic department of the company.

Howard C. Hanson, manager of truck tire sales of the Republic Rubber Co. of Youngstown, Ohio, has been elected a director of the company.

The William O. Goodrich Co. of Milwaukee has been granted drawback allowances of raw or boiled linseed oil, oil cake and oil meal manufactured from imported flaxseed.

The National Plate Glass Co., a subsidiary of the Fisher Body Corporation, is erecting a new $5,000,000 plant at Blairsville, Pa. It is expected the plant will be ready for operation next August.

Effective Oct. 29, the Turkish authorities have levied a consumption tax of 80 piasters per kilo on vegetable-oil products. They are reported to be willing that importers pay this tax as a deposit under reserve for the present.

Market Conditions

Numerous Price Changes Follow Trading in Chemicals

Majority of Fluctuations Is Downward and Lower Average Price Level Prevails—Consuming Industries Buying Moderately

DEMAND for chemicals and kindred products is spotted at present, with some selections moving freely while others receive but little attention. This is true alike of spot buying and of contracts for deferred deliveries.

The movement of many heavy chemicals against old orders is up to normal in volume with some variations according to the position of principal consuming industries. Caustic soda has been steadily reported as in good demand and advices of the week show no change in that condition. Export inquiry also is said to be better and very little selling pressure is noted among sellers. Bleaching powder and liquid chlorine are taken in good sized quantities but consumption has failed to equal production and the market still suffers from surplus stocks in sellers' hands. Mineral acids improved their position materially since early Fall but present buying is not very active.

The index number for the week fell off 25 points from that of the preceding week. This shows the tendency of values is still downward and many commodities may be included in the group which is forcing prices to lower levels. Ample stocks, keen competition and only moderate buying are the factors responsible for the declines. This may be summed up by saying that current domestic production, plus the influx of imported chemicals, gives a supply greater than present consumption.

Interest in tariff changes was stimulated during the week by a hearing before the Tariff Commission on applications for a lower duty on magnesite. Application also was made for a reduction in duty on calcium arsenate with the announcement that southern interests would ask the new Congress to amend the Tariff Act and place calcium arsenate on the free list. In this connection it was stated that about 32,000,000 lb. of calcium arsenate was used this season in the cotton growing states and with indications that still larger amounts would be required next season, provision must be made to furnish an adequate source of supply at reasonable prices.

Another topic of interest during the week was found in rumors that excessive taxation and other unfavorable conditions were forcing chemical manufacturers in Germany to move their operations to other countries. The United States was mentioned as a possible field for many of their manufactures. Some credence was given to these reports by the fact that German interests are known to have been making investigations in this country

Acids

Acetic Acid—The steady position of raw materials is reflected in the market for the acid and prices have been on an unchanged basis for some time. Some competition is noted in glacial and prices show a range according to seller.

Tin Oxide Again Higher—Tin Crystals and Bichloride Also Advanced — Arsenic Stronger—Domestic Copper Sulphate Lower — Liquid Chlorine Down to 3c. Per Lb. —Tartaric Acid Declines—Bichromate of Potash Easier —Barium Carbonate Freer on Spot—Prussiates Quiet

Quotations are $3.38@$3.63 per 100 lb. for 28 per cent; $6.78@$7.13 per 100 lb. for 56 per cent; $9.58@$9.83 per 100 lb. for 80 per cent; $12@$12.78 per 100 lb. for glacial.

Boric—First hands offer borax at 5¼c. per lb. in bags, carlots, for granulated and refined, crystals or powdered. The acid is moving in a fairly seasonal way with sellers competing keenly. Asking prices hold at 9½@10c. per lb. for powdered or crystals, in bags; 10@10½c. per lb. in bbl.; and 10½@11c. per lb. in kegs.

Citric Acid—Present buying is unimportant and the market is unsettled from a price standpoint as different quotations are heard in different quarters. Slow demand, however, makes it a buyers' market and imported acid can be bought for 47c. per lb. in the spot market. Shipments from abroad range from 29c. to 31c. per lb., according to seller and grade. The latter price is c.i.f. New York, and does not include duty. Domestic acid is quoted at 49@50c. per lb.

Lactic Acid—Withdrawals against old orders account for a good movement from producing points. New business is moderate. Imported acid is in light supply and is not competing strongly. Asking prices are 4½@5c. per lb. for 22 per cent dark and 5½@6c. per lb. for 22 per cent light; 9½@10c. per lb. for 44 per cent dark and 11½@12c. per lb. for 44 per cent light.

Nitric Acid—While quotations are repeated at former levels, sellers are reported to be carrying heavy stocks and with buying none too brisk, values are not strong. The schedule of prices quotes 36 deg. at 4½@5c. per lb.; 38 deg. at 4¾@5¼c. per lb.; 40 deg. at 5@5½c. per lb.; 42 deg. at 5¼@5¾c. per lb., the prices applying to acid in carboys in carload lots.

Oxalic Acid—Most of current trading is for small lots. No change in conditions has taken place during the week. The market is under some pressure due to offerings of foreign made acid. The latter has sold down to 11¼c. per lb., with 11¾@12c. per lb. generally asked. Domestic makers will meet competition on desirable business but are quoting 12c. to 12½c. per lb. for spot goods on a quantity differential.

Tartaric Acid—Prices have been easy for some weeks and the relatively low prices asked for imported acid finally resulted in an open decline in the price for domestic. The decline amounted to 1½c. per lb. and made the new selling price 31c. per lb. Even at the lower level domestic makers were at a disadvantage as imported grades have been pressed for sale and have been weakened by the lack of buying and because of the lower figures at which shipments from abroad were offered. Imported acid on spot was held at 28c. per lb. but was easy in tone. Shipments were quoted as low as 27c. per lb. duty paid.

Potashes

Bichromate of Potash—Reports were heard that offerings were on the market last week at 9¼c. per lb. It was also stated that this figure had been quoted on export inquiry. The inside quotation of large sellers, however, was kept at 9½c. per lb. Buying is light and there is nothing to indicate a change in that respect over the remainder of the month. Chrome ore is quoted at $19.50 per ton for Indian; $21.50 per ton for Rhodesian and $24 per ton for New Caledonian. Some large contract business was reported in the ore.

Caustic Potash—The market has been irregular as holders of imported grades have granted concession and goods have changed hands as low as 6¼c. per lb. in the spot market. General asking prices

for spot holdings range from 6¾c. to 7c. per lb. Shipment prices were easy at 6¾c. per lb. Arrivals this week from abroad were large.

Chlorate of Potash—An easy feeling prevailed and was increased by reports that sales had gone through under 7c. per lb. Spot holdings of imported were quoted at 7@7½c. per lb. Domestic chlorate is quiet and nominal at 8½c. per lb. at works.

Permanganate of Potash—Imported grades were on the market in large volume and prices heard ranged from 15½c. to 16c. per lb. Demand was slow and even at the lower prices buyers were not attracted. Shipments were higher than spot material, the lowest quotation for the former being 16½c. per lb.

Prussiate of Potash—In spite of reports that prices had strengthened the course of the spot market was irregular and in some quarters it was stated that yellow prussiate was offered at 23c. per lb. Most sellers were asking 24c. per lb. but buyers are not operating and the market is not viewed with confidence. Shipment prices ranged from 21c. to 23c. per lb., varying according to seller.

Miscellaneous Chemicals

Arsenic—Interest in arsenic has improved and inquiry for spot material came from dealers and from consumers. The easier tone noted in the market in the previous week gave way to firmness, and 14c. per lb. was the lowest price heard in the latter part of the period. Shipments were quoted at 13½c. per lb. by some domestic producers, but it was difficult to find sellers at that price in the open market and bids at 13½c. per lb. for Japanese arsenic were refused. The latter closed nominal at 13¾c. per lb.

Bleaching Powder—There is a fair call for bleaching powder, but the market is working into a better position as production is said to be in excess of present consumption. Uncertainty regarding future prices has helped to curtail trading in distant deliveries, but numerous contracts have been placed since the lower prices went into effect, and this has been helped by the fact that price reductions have been extended to include business placed before the reductions. Asking prices for prompt and for 1924 contracts remain at $1.25 per 100 lb. in drums, carlots, at works. Liquid chlorine has been reduced to 3c. per lb. in tank cars at works for 1924 contracts and considerable business is said to have been placed in the past week.

Antimony—The firm tone which has been in evidence gave way somewhat last week and the market was a little easier. Holders offer Chinese and Japanese brands, 8¾@9c. W.C.C., 9½@9¾c. Cookson's "C" grade, spot, 10½c. Chinese needle antimony, lump, nominal, 5½c. per lb. Standard powdered needle antimony (200 mesh), 6@6½c. per lb. White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, 7½c. per lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	164.73
Last week	164.98
Dec., 1922	165.00
Dec., 1921	145.00
Dec., 1920	189.00
Dec., 1919	245.00
Dec., 1918	277.00

Numerous price changes in chemicals with copper sulphate and formaldehyde closing lower, resulted in a 25 point reduction in the index number.

Bauxite—Offerings are on a basis of: American, crushed and dried, $5.50@$8.75 per gross ton; pulverized and dried, $12@$14 per gross ton; calcined, crushed, $20@$24 per gross ton, all f.o.b. shipping points.

Foreign red bauxite, French, 5 per cent SiO_2, $5@$6; Dalmatian, 2 per cent SiO_2, $6@$6.50 per metric ton, according to grade; foreign white grades, low iron content, $7.50@$8.50, c.i.f.

Copper Sulphate—Producers are offering supplies more freely and the market is lower on the domestic, closing nominally at 4.65@4.75c. per lb. Imported held at 4¾c. per lb., forward delivery. Importers say that domestic producers are inclined to meet foreign competition and that this accounts for the lowering of prices. Demand has been along routine lines only, but business is expected to improve from now on.

Formaldehyde — Consumption good, but production more than ample for current needs and prices are unsettled. There were offerings by first hands at 10½@10¾c. per lb., immediate delivery.

Barium Carbonate—Spot holdings augmented by recent importations and a little selling pressure was in evidence. There were offerings on spot at $67 per ton with the undertone easy.

Tin Products—The feature in the market was the uplift in oxide, producers raising the price to 51c. per lb., which compares with 49c. per lb. a week ago. The strength in the metal was given as the reason for the uplift. First hands also revised prices for bichloride and crystals, advancing the former to 13½c. per lb., and the latter to 34½c. per lb.

Sal Ammoniac — Imported material offered freely and prices repeated at 6½@6¾c. on spot, with a possibility of shading the inside figure on forward material.

Pyrites — Trading continues along moderate lines but improvement is reported. Sellers quote imported lump, 1 in. diameter and up, 12c. per long ton unit; furnace size, 2½ in. diameter, 12c. per long ton unit; fines, through ½ in. mesh, 12c. per long ton unit; cinder property of buyer, ex ship, Atlantic ports. Ore contains 50@51 per cent sulphur; cinder about 63 per cent iron.

Sulphur—There is a good call from acid makers and from other consumers. Prices are steady at $16@$18 per ton f.o.b. Texas and Louisiana mines; $18@$20 for export, f.a.s. New York.

Sodas

Bichromate of Soda — Many consumers are covered on contract and deliveries are regular. New business is not active but some sellers say total business on their books is fairly normal. Basic conditions do not change much and this also holds true of the selling end of the business. On desirable business producers have competed keenly and there is no reason to expect a change in that respect. The market also is unchanged with respect to the range in quotations according to seller. The lowest price heard for carlots at works is 7½c. per lb. and ranges up to 7¾c. per lb.

Caustic Soda—The market preserves a steady tone with a steady delivery to consumers against existing orders. Prices are still maintained at 3.10c. per lb. for 76 per cent in carlots at works. Ground and flake caustic is offered at 3½c. per lb. at works.

Nitrate of Soda—Chief interest in this market centers in the possibility of price changes more in favor of consumers. Actual trading is quiet in all positions and consumers appear to be covered for nearby needs. Well-posetd nitrate men say that costs in Chile can be adjusted to meet competition of other nitrates and they also state that the yield from the nitrate ore in Chile can be materially increased with a corresponding decline in production cost. In the meantime the market for spot nitrate is largely nominal around $2.45 per 100 lb.

Prussiate of Soda—There was very little change in this material during the past week. Spot prussiate was variously quoted from 11½c. per lb to 12c. per lb. and shipments were 11@11½c. per lb.

Alcohol

While demand for denatured alcohol is described as good, the buying is not quite up to expectations. Prices, however, are firmly maintained, with interest centering in the No. 5 completely denatured which is held on the carload basis of 44½c. per gal., drums extra. Especially denatured, formula No. 1, 190 proof, is offered on the carload basis of 45½c. per gal., drums extra. There is a steady market for ethyl spirits, U.S.P., 190 proof, in bbl., holding at $4.78 per gal. Reports on the condition of the market for methanol were more encouraging, several operators taking a firmer view of the situation. Prices for methanol closed unchanged, and pure, in tank cars, holding at 90c. per gal., with the same grade in cooperage at $1.05 and in drums at $1. The 95 per cent grade held at 93c. per gal., in bbl., and the 97 per cent grade at 95c. per gal., in bbl.

Coal-Tar Products

Phenol Steadies on Improved Demand—Foreign Offerings of Crude Napthalene Plentiful—Pyridine Easy

MORE buying interest was in evidence in the market for phenol, some of the larger distributors taking on material for future delivery. Prices underwent little change, but the undertone was firmer, with several handlers not at all anxious to force sales. Crude naphthalene was offered freely by foreign producers and this tends to keep the market for the refined grades down to what traders regard as a reasonable level. Intermediate makers appear to be well supplied with crudes.

News from the coke-producing sections has been more encouraging. Prices have steadied and production of coke is gaining. The gasoline market held about steady and trade authorities believe that the outlook, on the whole, is more promising.

In the meantime the market for benzol continues to drift along in a kind of a rut, producers sustaining prices on the 90 per cent and pure grades to offset low prices for the motor fuel material. Solvent naphtha production is not large enough to warrant any change in the selling schedule and in several directions prices presented a rather steady appearance. Crude cresylic acid was available at less than 65c. per gal., with the market on the refined grades wholly nominal on liberal offerings. Pyridine was easy, both on spot and for shipment, foreign material coming along with a fair degree of regularity.

Market Reports in Detail

Aniline Oil and Salt—The market for aniline oil was a steady affair. Producers continued to offer material for immediate shipment at 16c. per lb., in drums, carload basis. Aniline oil for red held around 40c. per lb., in drums. The situation in salt underwent no change, prices being barely steady at 22@23c. per lb.

Benzene—There was an irregular market for benzene in outside quarters, but leading operators did not care to force business and open prices were maintained on the 21c. tank car basis for the 90 per cent grade. Pure benzene held at 23c. per gal., tank cars, f.o.b. works. A little export inquiry was around during the week. Domestic trade was fair.

Benzidine — Steady prices prevailed for benzidine base, traders asking from 82@85c. per lb. in bbl., according to quantity. The sulphate was available at 70@73c. per lb.

Benzyl Chloride—First hands offered the 95@97 per cent material, in carboys, at 40c. per lb. Demand was moderate only. On the technical material leading factors quote 25c. per lb., in drums, prompt shipment.

Beta-Naphthol — The market was firm, but prices underwent no change, producers offering the technical grade on the carload basis of 25c. per lb.

Cresylic Acid—Traders say that a good deal of the cheap material has been disposed of, yet prices were irregular and more or less nominal. Crude was offered for shipment at 65c. per gal., in drums, with intimation that the price could be shaded in round lots. The 95 per cent grade the market held around 70c., with the 97 per cent grade at 75@80c., according to color, etc. Several shipments of cresylic acid and coal-tar distillate arrived here during the week.

Naphthalene — Advices from Manchester report a quiet and uninteresting market for crude naphthalene. Good quality crude for prompt shipment was offered at £10@£11 per ton, works. High-grade crude was offered here on the c.i.f. basis of 2¼c. per lb. The market for flake for shipment was nominally unchanged at 6@6¼c. per lb., with moderate activity at the inside figure. Ball was nominal at 7c. per lb. Chips held at 5@5½c. per lb., as to grade and seller.

Ortho Toluidine — Producers offered prompt material at 13@15c. per lb., with the undertone fairly steady.

Phenol — With increased activity in futures and new production not so large as most traders expected the market at the close was regarded as fairly steady. Several handlers refused to shade 26c. per lb. on U.S.P. material, in drums, and the price of 25c. per lb. was generally accepted as inside. One factor held out for 25c. on forward business and it was rumored that production now is well taken care of by the recent trading in futures.

Paranitraniline — Business was restricted chiefly to small lots and with competition keen, prices were barely steady, ranging from 70@75c. per lb., as to quantity and seller.

Pyridine — Importations have been large enough to take the edge off the market and prices were rather easy in nearly all quarters. On spot it was possible to pick up supplies around $4.75 per gal., with nearby material nominal at $4.50 per gal. On futures $4 could have been shaded on a bid.

Salicylates—Demand was moderate, but producers look for business to improve. With the crude materials situation steady the undertone of the market was firm. No price changes were announced by first hands during the past week.

Solvent Naphtha—Demand was fair and with no large holdings the market was regarded as steady. Leading factors quote 23c. per gal., tank cars, for the water white, and 20c. per gal., tank cars, for the crude, f.o.b. works.

Xylidine — Makers reported steady prices, the market holding at 50@52c. per lb., in drums, accrding to quantity.

Financial

The American Cyanamid Co. has declared an extra dividend of ½ of 1 per cent on the common in addition to regular quarterly dividends of 1 per cent on the common and 1½ per cent on the preferred.

The balance sheet of the Beech-Nut Packing Co., as of Sept. 30, shows assets of $11,016,787.

Profits of the Diamond Match Co. for the present year are expected to exceed $2,000,000. This would be equivalent to about $12 a share on the outstanding stock.

The International Salt Co. has declared a dividend of 1½ per cent and an extra dividend of 1 per cent.

The Pittsburgh Plate Glass Co. has declared an extra dividend of 5 per cent in addition to three regular quarterly dividends of 2 per cent. Extra dividend is payable Feb. 15 to stock of record Jan. 31.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	67	*68
Allied Chem. & Dye	67½	66⅞
Allied Chem. & Dye pfd	108	109½
Am. Ag. Chem.	13¼	12
Am. Ag. Chem. pfd	36	35½
American Cotton Oil c'f's	...	9
American Cyanamid	*85	*88
Am. Drug Synd	5½	5½
Am. Linseed Co.	17	16⅞
Am. Linseed pfd	32	32
Am. Smelting & Refining Co.	59	59¼
Am. Smelting & Refining pfd.	95½	95½
Archer-Daniels Mid. Co., w.i.	23	*22
Archer-Daniels Mid. Co. pfd.	91	*88½
Atlas Powder	52	52¾
Casein Co. of Am.	65	*65
Certain-Teed Products	*35	30
Commercial Solvents "A"	34	38
Corn Products	132¾	133⅜
Corn Product pfd.	119½	119½
Davison Chem.	69	69⅜
Dow Chem. Co.	*47	*47
Du Pont de Nemours	127⅜	125⅜
Du Pont de Nemours db.	86	*86
Freeport-Texas Sulphur	14	13
Grasselli Chem.	*125	*125
Grasselli Chem. pfd.	*105	*105
Hercules Powder	*110	*110
Hercules Powder pfd.	*104	*104
Heyden Chem.	*1	*1
Int'l Ag. Chem. Co.	*1	*1
Int'l Ag. Chem. pfd.	5¾	5⅞
Int'l Nickel	12¼	11½
Int'l Nickel pfd.	80	80
Int'l Salt	*89½	*89½
Mathieson Alkali	40⅜	46
Merck & Co.	*65	*65
National Lead	126½	126
National Lead pfd.	*110¾	111
New Jersey Zinc	*150	*150
Parke, Davis & Co.	*78	*78
Pennsylvania Salt	91½	*91½
Procter & Gamble	*135	*135
Sherwin-Williams	28⅞	29
Sherwin-Williams pfd.	*100	*100
Tenn. Copper & Chem.	9½	8⅞
Texas Gulf Sulphur	61⅜	59⅜
Union Carbide	54⅞	55⅞
United Drug	79½	78
United Dyewood	*38½	39⅞
U. S. Industrial Alcohol	62½	62
U. S. Industrial Alcohol pfd.	*98	*98
Va.-Car. Chem. Co.	9½	9
Va.-Car. Chem. pfd.	31½	*30

*Nominal. Other quotations based on last sale.

Vegetable Oils and Fats

Steady Call for China Wood Oil—Linseed Futures Irregular Niger Palm Oil and Extra Tallow Lower

SPOT holdings of most vegetable oils and animal fats are moderate, which supported prices in what traders regarded as a quiet market. Slight reductions in prices were reported in the lower grades of palm oil, tallow and greases. Cottonseed oil held fairly steady, notwithstanding the decline in lint. Attention centered in the report that Germany had made proposals to the Reparations Commission for a floating loan to cover foodstuffs purchases. Linseed oil was steady on spot, but irregular in the more distant positions. China wood oil was fairly active. Higher prices obtained for refined rapeseed oil. Corn oil, crude, closed lower.

Cottonseed Oil—Prices did not move much one way or the other, the undertone steadying on continued light offerings of crude. The decline in cotton did not shake out any of the longs in the option market. The action of lard, based largely on publication of a report to the effect that Germany would receive the moral support of the United States in the matter of obtaining a food loan, served to strengthen bullish sentiment in the edible oil trade. Private estimates on the cotton crop were more optimistic, several authorities on cotton placing the crop in the neighborhood of 10,000,000 bales. Refiners bought crude at 9¼@9⅜c. per lb., tank cars, f.o.b. mills, the market closing at 9⅜c. asked. Against purchases of crude there was considerable hedging in refined oil. Refiners tendered December oil, but these soon were stopped by longs who operated so extensively in October. Prime summer yellow refined oil on spot closed around 11⅜@11½c. per lb., in bbl. The forward positions, in the option market, were at a premium. Cash trade in oil and compound was slow throughout the week. Lard compound for immediate delivery closed at 13¼@13½c. per lb., carload basis. Stocks of pure lard in Chicago on December 1 were placed at 7,017,243 lb., against 5,358,184 lb. a year ago.

Linseed Oil—The market was a quiet affair. Spot and nearby oil held steady, several crushers being poorly supplied with seed and it was reported that not one of the operators was in a position to offer prompt material at all freely. On futures the situation was somewhat different. Crushers entertaining bearish views were inclined to offer April forward oil at concessions. It was reported that one lot of oil sold for April-September delivery on the basis of 81c. per gal., in bbl. January-April oil was offered at 86@88c. per gal., in bbl., the price depending upon the seller. Spot and nearby oil held at 90@92c. per gal., carload basis, cooperage included. The seed markets ruled firm. Buenos Aires reported some rain in the flaxseed belt and this steadied prices. The December option in the South American market held around $1.83 per bu. No reports of damage to the new Argentine crop have reached this country and traders generally assume that production will break all records. Total shipments of flaxseed from the Argentine since January 1 amounted to 43,000,000 bu. Receipts of new crop domestic seed at the principal Northwestern terminals amounted to 11,000,000 bu. Linseed cake for export was higher, closing at $41@$42 per ton, f.a.s. New York.

China Wood Oil—Spot oil sold at 21c. per lb., but later holders refused to shade 21½c. Offerings from China have been light. The prevailing cost of import is nearer 22½c., according to reports. On the Pacific coast 20c. was asked for nearby oil, sellers' tanks. Demand good.

Higher Duties Are Sought on Flaxseed and Linseed Oil

Flaxseed growers in North Dakota, the largest producing state, through their representatives in the Senate and in the House of Representatives have made formal application to the Tariff Commission to increase the duty on flaxseed from 40c. to 60c. per bu. This is the maximum increase allowed by the flexible provisions of the tariff act. Their application also provides for a corresponding increase in duty on linseed oil. They also will petition Congress to amend the Fordney-McCumber tariff act with a view of increasing the duties on these two commodities.

Coconut Oil—Scattered business in Ceylon type oil, nearby shipment from the coast, was reported at 8½c. per lb., sellers' tanks. On January forward the coast market settled at 8¼@8⅜c. per lb., tank car basis. In New York 8⅜c. was asked. Demand was quiet in all directions.

Corn Oil—Crude corn oil sold at 9⅜c. per lb., sellers' tanks, f.o.b. shipping point, a decline of ⅛c. for the week.

Olive Oil Foots—Green Italian foots for shipment closed at 8¾@9c. per lb., landed weights, with the market firm. Spanish foots for shipment advanced to 8½@8⅝c. per lb.

Palm Oils—Several hundred tons of Niger oil sold on spot at 6.85c. per lb. Niger for shipment held around 7c. Lagos on spot sold at 7⅛c. per lb.

Rapeseed Oil—English refined for December arrival offered through second hands at 76c. per gal. January shipment from other side advanced by importers to 79c. per gal.

Soya Bean Oil—Crude offered at 9⅛c. per lb., duty paid, tank cars, f.o.b. Pacific coast. Stocks in New York nil.

Fish Oils—Newfoundland tanked cod oil steady at 68@70c. per gal., with demand moderate only. Additional business reported in crude menhaden oil at 47½c. per gal., tank cars, f.o.b. factory, cleaning up most of the holdings along coast. Fishing off North Carolina has ceased. Production of oil said to be larger than a year ago.

Tallow, Etc.—About 1,000,000 lb. of tallow sold on the basis of 7⅛c. per lb. for extra special, a decline of ⅛c. Market barely steady at decline, the weakness in low grade greases being a factor. House and yellow offered at 6c. per lb., loose, a drop of ⅛c. Oleo stearine sold at 11c. per lb.

Miscellaneous Materials

Barytes—Purchasing operations in barytes are on about the same basis as in 1923, according to one large dealer, and the outlook for 1924 is considered good. Prices held steady, the crude bringing $7@$10 per ton, f.o.b. point of production and $15 per ton, f.o.b. New York. Ground white, $15@$16 per ton; off color, $13@$14 per ton, f.o.b. Baltimore. Water ground and water floated, $26@$28 per ton, f.o.b. St. Louis.

Diatomaceous Earth—Natural aggregate, $25 per ton; insulating powder, $45; filtration powder, $35; calcined aggregate, $45, f.o.b. plant, California.

Glycerine—Dynamite offered at 16c. per lb., carload basis, f.o.b. point of production, with no buying interest. Chemically pure offered at 16½c. per lb., with market unsettled. Crude soap lye, basis 80 per cent, loose, offered at 10⅜c. per lb., f.o.b. point of production. Saponification, basis 88 per cent, loose, nominal at 11⅜@12c. per lb.

Naval Stores—Trading slow and prices irregular. Spirits turpentine on spot offered at 93c. per gal. Rosins easier and on the lower grades there were sellers at $5.60 per bbl. Export demand quiet.

Shellac—T.N. on spot raised to 61@63c. per lb., according to quantity and seller. Offerings not so plentiful and with little change in Calcutta the undertone now favors sellers. Bleached, bonedry, offered at 72@74c. per lb. Superfine orange nominal at 66@67c. per lb.

White Lead—There was a higher market for the metal, but prices for the lead pigments underwent no change. The official quotation for pig lead was raised to 7.25c. per lb. Lead is scarce, some producers being completely sold out for December and January. Standard dry white lead was offered by leading producers on the carload basis of 9¼c. per lb., in casks. Business has been good and prospects for the near future are favorable.

Imports at the Port of New York

November 30 to December 6

ACIDS—Cresylic—38 dr., Glasgow, Order. **Citric**—20 csk., Palermo, Order; 70 cs., Bordeaux, Order. **Boracic**—257 bg., Leghorn, Pacific Coast Borax Co. **Lactic**—84 cs., Rotterdam, Mallinckrodt Chemical Works. **Oxalic**—25 csk., Rotterdam, R. W. Greeff & Co.; 65 csk., Christiania, Roessler & Hasslacher Chemical Co. **Tartaric**—50 keg, Hamburg, W. Benkert & Co.; 137 csk., Rotterdam, Order; 200 csk., Palermo, Order.

ALBLMEN—112 cs. hen, London, Balfour, Williamson & Co.

ALCOHOL—2 bbl. butyl, Havre, De Mattia Chemical Co.; 4 csk. amyl, Hamburg, Order; 100 dr. denatured, San Juan, Lamborn & Co.; 100 bbl. do., San Juan, C. Esteva; 25 dr. do., San Juan, C. Esteva; 50 csk. butyl, Bordeaux, Commercial Solvents Corp.

ALIZARINE—5 csk., Hamburg, Kuttroff, Pickhardt & Co.; 1 bbl., Antwerp, Order.

AMMONIUM CHLORIDE—2 cs., Melbourne, American Express Co.

ANTIMONY ORE—1,066 bg., Antofagasta, Watson, Geach & Co.

ANTIMONY OXIDE—250 cs., Hankow, Asia Banking Corp.

ANTIMONY REGULUS—1,000 cs., Hamburg, Order; 251 cs. London, National City Bank; 500 cs., Hankow, Asia Banking Corp.

ANTIMONY SULPHIDE—44 csk., Antwerp, L. H. Butcher & Co.

ANTIPYRINE—20 kegs, Antwerp, C. B. Richard & Co.

ARSENIC—42 csk., Bordeaux, Order.

BARIUM CARBONATE—1,196 bg., Hamburg, Order; 78 csk., Hamburg, A. Klipstein & Co.; 84 csk., Hamburg, Innis, Speiden & Co.

BARIUM CHLORIDE—58 csk., Hamburg, Goldschmidt Corp.; 72 csk., Hamburg, Roessler & Hasslacher Chemical Co.

BARIUM SUPEROXIDE—152 csk., Hamburg, W. A. Brown & Co.

BARYTES—200 bg., Hamburg, Cooper & Cooper; 250 bg., Hamburg, Roessler & Hasslacher Chemical Co.; 192 csk., Hamburg, A. Klipstein & Co.; 500 bg., Hamburg, Irving Bank-Col. Trust Co.

BRONZE POWDER—16 cs., Bremen, B. F. Drakenfeld & Co.

BUTYL ACETATE—12 dr., Rotterdam, Lunham & Reeve.

CALCIUM CHLORIDE—179 dr., Hamburg, Goldschmidt Corp.

CALCIUM NITRATE—916 csk., Brevik, Order.

CAMPHOR—100 cs., Hamburg, A. Ochse & Co.; 45 cs., Hamburg, Order.

CASEIN—397 bg., Hamburg, Bank of the Manhattan Co.; 350 sk., Auckland, Bankers Trust Co.; 417 bg., Buenos Aires, T. M. Duche & Sons.

CHALK—950 bg., Antwerp, Bankers Trust Co.; 400 bg., Antwerp, Brown Bros. & Co.; 675 tons (bulk), London, Taintor Trading Co.; 325 tons (bulk), London, Taintor Trading Co.

CHEMICALS—15 bbl., Bremen, Order; 6 cs., Hamburg, Merck & Co.; 60 cs., Antwerp, Metz Laboratories, Inc.; 168 dr. and 30 bbl., Hamburg, Roessler & Hasslacher Chemical Co.; 70 carboys, Hamburg, R. H. Coney; 37 pkg., Hamburg, Order; 50 bbl., Hamburg, Hummel & Robinson; 16 csk., Hamburg, Jungmann & Co.; 40 bbl., Hamburg, A. Hurst & Co.; 20 bbl., Hamburg, Arco Trading Co.; 93 dr., Hamburg, A. Kramer & Co.; 281 pkg., Hamburg, Order.

CREAM TARTAR—72 cs., Rotterdam, Superfos Co.

COAL-TAR DISTILLATE—94 dr., Liverpool, Monsanto Chemical Works; 99 dr., Liverpool, Order.

COLORS—20 csk. dry, Southampton, Brown Bros. & Co.; 6 csk. coal-tar, Hamburg, Irving Bank-Col Trust Co.; 2 cs., Hamburg, Order; 1 bbl. dry, Hamburg, Carbic Color & Chemical Co.; 15 pkg. aniline, Hamburg, Franklin Imp. & Export Co.; 250 bg. blue, Hull, Reckitts Blue Co.; 20 csk. do., Hull, F. B. Vandegrift & Co.; 7 bbl. aniline, Antwerp, Order; 33 csk. coal-tar, Rotterdam, H. A. Metz & Co.; 123 csk. aniline, Rotterdam, Kuttroff, Pickhardt & Co.; 24 bbl. aniline, Genoa, American Exchange Nat'l Bank; 6 bbl. do., Genoa, Order.

COPRA—84 bg., Morant Bay, Franklin Baker Co.; 3,270 bg., Belize, Franklin Baker Co.

CYANAMIDE—28,556 dr., Hamburg, Guaranty Trust Co.

DEXTRINE—200 bg., Rotterdam, Stein, Hall & Co.; 350 bg., Copenhagen, Stein, Hall & Co.

DYES—32 pkg., Bombay, National Aniline & Chemical Co.; 5 cs. aniline, Bombay, Order; 2 csk. aniline, Genoa, American Exchange National Bank.

EPSOM SALT—200 bbl. and 1,000 bg., Hamburg, Innis, Speiden & Co.

FERRIC OXIDE—153 csk., Hamburg, Iron & Ore Corp.

FERROCHROME—28 csk., Gothenburg, D. Heydemann & Co.

FERROSILICON—630 ton (bulk) and 270 keg, Stavanger, Electro Metallurgical Co.

FLUORSPAR—267 bg., Hamburg, Roessler & Hasslacher Chemical Co.

FUSEL OIL—15 dr., Antwerp, Order; 13 dr., Antwerp, Order; 3 csk., Hamburg, A. Klipstein & Co.; 8 dr., Hamburg, Order; 1 dr., London, Order; 3 csk., Hamburg, Order; 44 dr., Hamburg, Order.

FULLERS EARTH—620 bg., London, L. A. Salomon & Bros.

GLAUBER SALT—144 csk., Hamburg, Bengal Trading Co.

GLYCERINE—50 dr., London, Marx & Rawolle.

GUMS—56 cs. tragacanth, Southampton, Order; 85 cs., Auckland, Guaranty Trust Co.; 32 cs. and 67 sk. do., Auckland, Chemical National Bank; 25 cs. do., Auckland, Equitable Trust Co.; 131 cs., 231 sk. and 183 pkg. do., Auckland, Baring Bros. & Co.; 590 cs. kauri, Auckland, Standard Bank of South Africa; 534 cs. do., Auckland, Order; 380 bg. yacca, Port Adelaide, Baring Bros. & Co.; 302 bg yacca, Port Adelaide, Order; 400 bg. copal, Antwerp, W. Schall & Co.; 300 bg. copal, Antwerp, Central Union Trust Co.; 205 bg. copal, Antwerp, National City Bank; 27 pkg. kauri, London, Davies, Turner & Co.; 47 bg. copal, London, Chemical National Bank; 100 cs. damar, 200 bg do., and 70 bg. copal, Singapore, L. C. Gillespie & Sons; 43 bg. copal, Singapore, Baring Bros. & Co.; 50 cs. damar, Singapore, Standard Bank of South Africa; 100 bg. damar, Singapore, Chemical National Bank; 170 cs. copal, Singapore, Kidder, Peabody & Co.; 100 cs. damar, Singapore, Order; 140 bg. copal, Manila, Order.

IRON OXIDE—40 csk., Liverpool, Order.

LITHOPONE—200 csk., Rotterdam, Reichard-Coulston, Inc.,; 800 csk., Rotterdam, Order.

LOGWOOD—1 parcel, Miragoane, Order; 100 bbl. extract, Cape Haitian, Logwood Mfg. Co.

MAGNESITE—12 csk. calcined, Glasgow, Frazar & Co.

MAGNESIUM CHLORIDE—250 dr., Hamburg. Order; 250 csk, Hamburg, American Commerce & Finance Co.

MANGANESE—262 bbl., Rio de Janeiro, Hardy & Ruperti, Inc.

MINERAL WHITE—300 bg., Hull, C. B. Chrystal Co.; 100 bg., Hull, Whittaker, Clark & Daniels.

MYROBALANS—4,850 pkt. crushed, Calcutta, National City Bank; 2,181 bg., Bombay, Order; 4,434 bg., Bombay, Order.

NAPHTHALENE—300 bg., Rotterdam, White Tar Co.; 775 bg., Hamburg, Order.

OILS—Coconut—700 tons (bulk), Manila, Equitable Trust Co.; 2,121,211 lb. (bulk), Manila, Procter & Gamble Co. **China Wood**—218 bbl., London, Order; 250 dr., London, Order. **Cod**—300 csk., St Johns, National Oil Products Co. **Linseed**—131 dr., Rotterdam, W. Van Doorn; 31 bbl., London, International Composition Co. **Olive Foots** (sulphur oil) 200 bbl., Naples, Order; 100 bbl., Palermo, Order. **Palm**—308 csk., Liverpool, Niger Co.; 200 csk., Liverpool, National City Bank; 877 csk., Hamburg, African & Eastern Trading Co.; 80 csk., Port Harcourt, Niger Co.; 240 csk., Koko, Niger Co.; 1,041 csk., Burutu, Irving Bank-Col. Trust Co.; 78 csk, Lagos, Grace Bros. & Co.; 239 csk., Sekondi, Order; 10 dr., Antwerp, Order. **Palm Kernel**—100 bbl. and 53 csk., Hull, Order. **Rapeseed**—206 bbl., Hull, Vacuum Oil Co.; 70 bbl., Hull, Balfour, Williamson & Co; 155 bbl., Hull, Order. **Sesame**—176 bbl., Rotterdam, Order; 58 bbl., Genoa, Order. **Sperm**—30 bbl., Glasgow, Order. **Whale**—100 csk., St. Johns, Marden-Wild Corp.

OIL SEEDS—Castor—4,278 bg., Bombay, Volkart Bros.; 5,432 bg., Bombay, Order; 15,242 bg., Bombay, Order. **Linseed**—8,263 bg., Buenos Aires, Order.

ORTHO-CRESOL—4 dr., Rotterdam, Lunham & Reeve.

PHOSPHATES—77 csk., Rotterdam, Roessler & Hasslacher Chemical Co.

PLUMBAGO—200 bbl. and 333 bg., Colombo, Order.

POTASSIUM SALTS—200 bg., sulphate, Bremen, Potash Importing Corp. of America; 1,000 bg. nitrate, Antwerp, Order; 143 dr. perborate, Hamburg, Roessler & Hasslacher Chemical Co.; 174 csk. caustic, Hamburg, T. Goldschmidt Corp.; 50 bbl. chlorate, Hamburg W. Schall & Co.; 2,800 csk. chloride, Hamburg, Mechanics & Metals Nat'l Bank; 1,000 csk. chloride, Hamburg, Irving Bank-Col. Trust Co.; 50 cs. and 50 csk. alum, Hamburg, Meteor Products Co.; 232 csk. caustic, Hamburg, A. Klipstein & Co.; 24 bbl. carbonate, Hamburg, Superfos Co.; 32 bbl. alum, Hamburg, Superfos Co.; 101 dr. caustic, Hamburg, Roessler & Hasslacher Chem. Co.; 20 dr. permanganate, Hamburg, Pfaltz & Bauer; 321 dr chloride, Hamburg, Phillip, Bauer & Co.; 96 csk. caustic, Hamburg, A. Klipstein & Co.; 1,200 csk, chlorate, Hamburg, Mechanics & Metals Nat'l Bank; 100 csk. chlorate, Hamburg, Order.

PYRIDINE—3 bbl., Havre, Irving Bank-Col. Trust Co.; 6 dr., Hamburg, Order; 25 dr., Rotterdam, Lunham & Reeve; 3 dr., Hamburg, Order.

QUEBRACHO—1,957 bg., Buenos Aires, J. C. Andresen & Co.; 4,100 bg., Buenos Aires, Bank of N. Y. & Trust Co.; 9,911 bg., Buenos Aires, Order.

QUICKSILVER—200 flasks, Genoa, Order; 1,000 flasks, Hamburg, Italian Discount & Trust Co.

ROCHELLE SALT—43 csk., Rotterdam, Superfos Co.; 132 bbl. and 33 csk., Rotterdam, Order.

ROSIN—125 csk., Bordeaux, American Express Co.

SAL AMMONIAC—142 csk., Hamburg, C. B. Richard & Co.; 110 csk., Hamburg, Order; 50 bbl., Hamburg, J. Munroe & Co

SHELLAC—88 cs., Havre, Order; 100 bg. and 100 cs., Calcutta, Equitable Trust Co.; 150 bg., Calcutta, Chatham & Phenix National Bank; 466 bg. and 103 bg. refuse, Calcutta, Order.

SILVER SULPHIDE—6 cs., Pacasmayo, W. R Grace & Co.; 83 cs., Antofagasta, Watson, Geach & Co.

SODIUM SALTS—7,041 sk. nitrate, Mejillones, Wessel, Duval & Co.; 12,568 sk. do., Mejillones, A. Gibbs & Co.; 130 dr. sulphide, Antwerp, E. M. Sergeant & Co.; 56 cs. metallic, Bergen, Bowring & Co.; 3,233 bg. nitrate and 49 csk. do., Brevik, Order; 348 dr. caustic, Hamburg, G. Goldschmidt Corp.; 700 dr. caustic, Hamburg, F. H. Hollesen, Inc.; 50 cs. superoxide, Hamburg, E. Suter & Co; 100 dr. caustic, Hamburg, A. Klipstein & Co.; 106 dr. sulphite, Hamburg, C. S. Grant & Co.; 134 csk. phosphate, Antwerp, Brown Bros. & Co.; 32 csk. prussiate, Rotterdam, Innis, Speiden & Co.; 17 csk. prussiate Rotterdam, Herrick & Voigt; 168 csk. phosphate, Rotterdam, Roessler & Hasslacher Chemical Co.; 15 csk. prussiate, Rotterdam, Chase National Bank; 551 csk. hyposulphite, Rotterdam, Kuttroff, Pickhardt & Co.; 10 kegs prussiate, Liverpool, Order; 360 bbl., silica fluoride, Copenhagen, Order; 38 csk. prussiate, London, Order; 205 bg. and 80 csk. nitrate, Christiania, Order; 18 csk. nitrite, Christiania, Order; 4,695 bg. nitrate, Antofogasta, W. R. Grace & Co.; 2,418 bg. nitrate, Inquique, W. R. Grace & Co.; 286 dr. carbonate, Hamburg, Roessler & Hasslacher Chem. Co.

STRONTIUM SULPHATE—3 csk., Hamburg, A. Klipstein & Co.

STARCH—500 bg., Rotterdam, Stein, Hall & Co.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0.25 –	$0.25½
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.63
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Acetic, 80%, bbl.	100 lb.	9.58 –	9.83
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.78
Boric, bbl.	lb.	.10 –	....
Citric, kegs	lb.	.47½–	.49
Formic, 85%	lb.	.12 –	.14
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.11½–	.12
22% tech., light, bbl.	lb.	.05½–	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½–	.05
Nitric, 42°, carboys	lb.	.05½–	.05½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.12 –	.12½
Phosphoric, 50% carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	11.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	16.00
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.28 –	....
Tartaric, domestic, bbl.	lb.	.31 –	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.81 –	....
Ethyl, 190 p'f, U.S.P., bbl.	gal.	4.78 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.51½–	...
No. 1, 190 proof, special, dr.	gal.	.45½–	...
No. 1, 188 proof, bbl.	gal.	.52½–	...
No. 1, 188 proof, dr.	gal.	.48½–	...
No. 5, 188 proof, bbl.	gal.	.50½–	...
No. 5, 188 proof, dr.	gal	.44½–	...
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.03 –	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.06½
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.07 –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. tech., casks	lb.	.09 –	.09½
Ammonium nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	4.50 –	4.75
Antimony oxide, white, bbl.	lb.	.07½–	.08
Arsenic, white, powd., bbl.	lb.	.13 –	.13½
Arsenic, red, powd., kegs	lb.	.15 –	.15½
Barium carbonate, bbl.	ton	68.00 –	72.00
Barium chloride, bbl.	ton	85.00 –	90.00
Barium dioxide, 88%, drums	lb.	.17½–	.18
Barium nitrate, casks		.07½–	.08
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.25 –	....
Spot N. Y. drums	100 lb.	1.75 –	....
Borax, bbl.	lb.	.05½–	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.13½–	.14
Calcium carbide, drums	lb.	.05 –	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	.06½–	.07
Camphor, cases	lb.	.86 –	.86½
Carbon bisulphide, drums	lb.	.06 –	.06½
Carbon tetrachloride, drums	lb.	.09 –	.09½
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04½
Domestic, heavy, bbl.	lb.	.03½–	.04
Imported, light, bbl	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04 –	.04½
Contract, tanks, wks	lb.	.03 –	....
Cylinders, 100 lb., wks.	lb.	.05½–	.06
Cylinders, 100 lb., spot	lb.	.08½–	.09
Chloroform, tech., drums	lb.	.30 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	20.00 –	21.00
Copper carbonate, bbl.	lb.	.18 –	.19
Copper cyanide, drums	lb.	.47 –	.50
Coppersulphate, dom., bbl.,	100 lb.	4.75 –	4.90
Imp. bbl.	100 lb.	4.36½–	4.50
Cream of tartar, bbl.	lb.	.22½–	.25½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	1 05 –	....
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 –	2.50
Ether, U.S.P., resale, dr.	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.97 –	....
Ethyl acetate, 99%, dr.	gal.	$1.12 –	$1.15
Formaldeayde, 40%, bbl.	lb.	.10½–	.10¾
Fullers earth—f.o.b. mines	ton	18.00 –	20.00
Fusel oil, ref., drums	gal.	.... –	....
Fusel oil, crude, drums	gal.	4.15 –	4.25
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.16½–	.17
Glycerine, dynamite, drums	lb.	.16 –	....
Glycerine, crude 80%, loose	lb.	.10¾–	....
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½–	.09¾
White, basic sulphate, casks	lb.	.08½–	.09
White, in oil, kegs	lb.	.11½–	.11½
Red, dry, casks	lb.	.10½–	.10½
Red, in oil, kegs	lb.	.13 –	.14½
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl.	lb.	.18 –	.20
Lime-Hydrated, bg, wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½–	.10½
Lithopone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07½–	.07½
Magnesium carb., tech., bags	lb.	.08½–	.08½
Methanol, 95%, bbl.	gal.	.93 –	....
Methanol, 97%, bbl.	gal.	.95 –	....
Methanol, pure, tanks	gal.	.90 –	....
drums	gal.	1.00 –	....
bbl.	gal.	1.05 –	....
Methyl-acetone, t'ks.	gal.	1.15 –	....
Nickel salt, double, bbl.	lb.	.10 –	.10½
Nickel salts, single, bbl.	lb.	.11 –	.11½
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.... –	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.09½–	....
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½–	.06¾
Potassium chlorate, powd.	lb.	.07½–	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08¾–	.08½
Potassium hydroxide (caustic potash) drums	lb.	.06¾–	.07
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.07½–	.09
Potassium permanganate, drums	lb.	.16 –	.16½
Potassium prussiate, red, casks	lb.	.55 –	.56
Potassium prussiate, yellow, casks	lb.	.25 –	.25½
Salammoniac, white, gran., casks, imported	lb.	.06½–	.06¾
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	24.00 –	26.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 –	....
bags, contract	100 lb.	1.38 –	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 –	....
bags, contract	100 lb.	1.45 –	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	3.00 –	3.10
Sodium acetate, works, bbl.	lb.	.05½–	.05½
Sodium bicarbonate, bulk	100 lb.	1.75 –	....
330-lb. bbl.	100 lb.	2.00 –	....
Sodium bichromate, casks	lb.	.07½–	.07¾
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04½
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19½–	.22
Sodium fluoride, bbl.	lb.	$0.08½–	$0.10¾
Sodium hyposulphite, bbl.	lb.	.02½–	.02
Sodium nitrite, casks	lb.	.07½–	....
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½–	.04
Sodium prussiate, yel. drums	lb.	.11½–	.11½
Sodium salicylic, drums	lb.	.40 –	.42
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 –	.04
Sodium sulphite, crys., bbl.	lb.	.03½–	.03½
Strontium nitrate, powd., bbl.	lb.	.11½–	.12
Sulphur chloride, yel drums	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08
Tin bichloride, bbl.	lb.	.13½–	.13¾
Tin oxide, bbl.	lb.	.49 –	....
Tin crystals, bbl.	lb.	.34½–	.35
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½–	.06½
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½–	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½–	....
French, green seal, bags	lb.	.10½–	....
French, white seal, bbl.	lb.	.12 –	....
Zinc sulphate, bbl.	100 lb.	2.75 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.70
Alpha-naphthol, ref., bbl.	lb.	.65 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.22½–	.23
Anthracene, 80%, imp., drums, duty paid	lb.	.65 –	.70
Anthraquinone, 25%, paste, drums	lb.	.80 –	.85
Benzaldehyde U.S.P., carboys	lb.	1.50 –	....
f.f.c. drums	lb.	1.60 –	....
tech, drums	lb.	75	....
Benzene, pure, water-white, tanks, works	gal.	.22½–	.23
Benzene, 90%, tanks, works	gal.	.21 –	....
Benzidine base, bbl.	lb.	.82 –	.86
Benzidine sulphate, bbl.	lb.	.72 –	.75
Benzoic acid, U.S.P., kegs	lb.	.85 –	.88
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref., carboys	lb.	.40 –	....
Benzyl chloride, tech., drums	lb.	.25 –	....
Beta-naphthol, tech., bbl.	lb.	.25 –	.26
Beta-naphthylamine, tech.	lb.	.75 –	.80
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.75 –	.85
95-97%, drums, works	gal.	.70 –	.75
Dichlorbenzene, drums	lb.	.06 –	.08
Diethylaniline, drums	lb.	.55 –	.60
Dimethylaniline, drums	lb.	.40 –	.41
Dinitrobenzene, bbl.	lb.	.18 –	.20
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.30 –	.35
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.06 –	.06½
Naphthalene, balls, bbl.	lb.	.06½–	.07
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.09½–	.10
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl.	lb.	1.10 –	1.15
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.15 –	.17
Ortho-nitrophenol, bbl.	lb.	1.20 –	1.30
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.16
Para-amifophenol, base, kegs	lb.	1.30 –	....
Para-amifophenol, HCl, kegs	lb.	1.55 –	....
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitroaniline, bbl.	lb.	.72 –	.73
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl.	lb.	.90 –	.95
Phthalic anhydride, bbl.	lb.	.30 –	.34
Phenol, U.S.P., dr.	lb.	.25 –	.26
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	5.00 –	5.25
Resorcinol, tech., kegs	lb.	1.40 –	1.50

Resorcinol, pure, kegs	lb.	$2.15 –	....
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.32 –	....
Salicylic acid, U.SP., bbl.	lb.	.35 –	....
Solvent naphtha, water-white, tanks	gal.	.23 –	....
Crude, tanks	gal.	.20 –	....
Sulphanilic acid, crude, bbl.	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.24 –	....
Toluene, drums, works	gal.	.29 –	....
Xylidine, drums	lb.	.50 –	....
Xylene, pure, drums	gal.	.50 –	.55
Xylene, com., drums	gal.	.34 –	....
Xylene, com., tanks	gal.	.29 –	....

Naval Stores

Rosin B-D, bbl.	280 lb.	$5.60 –	....
Rosin E-I, bbl.	280 lb.	5.60 –	....
Rosin K-N, bbl.	280 lb.	5.65 –	$5.90
Rosin W.G.-W.W., bbl.	280 lb.	6.45 –	6.80
Wood rosin bbl.	280 lb.	5.80 –	5.90
Turpentine, spirits of, bbl.	gal.	.93 –	....
Wood, steam dist., bbl.	gal.	.85 –	....
Wood, dest. dist., bbl.	gal.	.70 –	....
Pine tar pitch, bbl.	200 lb.	6.50 –	....
Tar, kiln burned, bbl.	500 lb.	11.00 –	....
Retort tar, bbl.	500 lb.	11.00 –	....
Rosin oil, first run, bbl.	gal.	.45 –	....
Rosin oil, second run, bbl.	gal.	.47 –	....
Rosin oil, third run, bbl.	gal.	.50 –	....
Pine oil, steam dist.	gal.	.65 –	....
Pine oil, pure, dest. dist.	gal.	.60 –	....
Pine tar oil, ref.	gal.	.48 –	....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	.... –	.75
Pine tar, ref., thin, bbl.	gal.	.... –	.25
Pinewood creosote, ref., bbl.	gal.	.... –	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.04 –	$0.04½
Grease, yellow, loose	lb.	.06½ –	.06¾
Lard oil, Extra No. 1, bbl.	gal.	.85 –	....
Neatsfootoil 20 deg. bbl.	gal.	1.32 –	....
No. 1, bbl.	gal.	.94 –	.96
Oleo Stearine		.11 –	....
Oleo oil, No. 1, bbl.	lb.	.15½ –	....
Red oil, distilled, d.p. bbl.	lb.	.08½ –	.09½
Saponified, bbl.	lb.	.08½ –	.09½
Tallow, extra, loose	lb.	.07½ –	....
Tallow oil, acidless, bbl.	gal.	.86 –	.88

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.13½ –	....
Castor oil, No. 1, bbl.	lb	.14 –	....
Chinawood oil, bbl.	lb.	.21 –	.21½
Coconut oil, Ceylon, bbl.	lb.	.09½ –	....
Ceylon, tanks, N.Y.	lb.	.08½ –	....
Coconut oil, Cochin, bbl.	lb.	.10 –	....
Corn oil, crude, bbl.	lb.	.11½ –	.12
Crude, tanks, (f.o.b. mill)	lb.	.09½ –	....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09½ –	....
Summer yellow, bbl.	lb.	.12 –	.13
Winter yellow, bbl.	lb.	.13½ –	....
Linseed oil, raw, car lots, bbl.	gal.	.90 –	....
Raw, tank cars (dom.)	gal.	.84 –	....
Boiled, cars, bbl. (dom.)	gal.	.92 –	....
Olive oil, denatured, bbl.	gal.	1.10 –	1.12
Sulphur, (foots) bbl.	lb.	.08½ –	.08½
Palm, Lagos, casks	lb.	.07½ –	....
Niger casks	lb.	.06½ –	.07
Palm kernel, bbl.	lb.	.08½ –	.08¾
Peanut oil, crude, tanks (mill)	lb	.12 –	....
Peanut oil, refined, bbl.	lb.	.15 –	.15½
Perilla, bbl.	lb.	.14½ –	.14¾
Rapeseed oil, refined, bbl.	gal.	.76 –	....
Rapeseed oil, blown, bbl.	gal.	.82 –	....
Sesame, bbl.	lb.	.12 –	.12½
Soya bean (Manchurian), bbl.	lb.	.11 –	....
Tank, f.o.b. Pacific coast	lb.	.09½ –	....
Tank, (f.o.b. N.Y.)	lb.	.10 –	....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.68 –	....
Menhaden, light pressed, bbl.	gal.	.64 –	....
White bleached, bbl.	gal.	.66 –	....
Blown, bbl.	gal.	.70 –	....
Crude, tanks (f.o.b. factory)	gal.	.47½ –	....
Whale No. 1 crude, tanks, coast	lb.	.... –	....
Winter, natural, bbl.	gal.	.75 –	.76
Winter, bleached, bbl.	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$34.00 –	....
Cottonseed meal, f.o.b. mills	ton	43.00 –	....
Linseed cake, bags	ton	41.00 –	42.00
Linseed meal, bags	ton	44.00 –	....

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04½ –	.04¾
Cutch, Rangoon, bales	lb.	.15 –	.16
Dextrine, corn, bags	100 lb.	3.69 –	3.90
Dextrine gum, bags	100 lb.	3.97 –	4.25
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.09¼ –	.10
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	90.00 –	....
Sumac, ground, bags	ton	$85.00 –	$90.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags	100 lb.	3.12 –	3.22
Tapioca flour, bags	lb.	.06 –	.07

Extracts

Archil, conc., bbl.	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09 –	.09½
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.14 –	.15
Logwood, liq., 51°, bbl.	lb.	.07½ –	.08
Quebracho, solid, 65% tannin, bbl.	lb.	.05 –	.05½
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.08 –	$0.10
spot, cases	lb.	.10 –	.14
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.45 –	.50
Prussian, bbl.	lb.	.45 –	.50
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.28 –	.30
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.26 –	.28
Reds Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.15 –	1.20
Yellow, Chrome, C.P. bbls.	lb.	.17½ –	.18
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.25½ –	$0.26½
Beeswax, crude, Afr. bg.	lb.	.22 –	....
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candelilla, bags	lb.	.23 –	.23½
Carnauba, No. 1, bags	lb.	.36 –	.38
No. 2, North Country, bags	lb.	.22 –	.22½
No. 3, North Country, bags	lb.	.17 –	.17½
Japan, cases	lb.	.16 –	.16½
Montan, crude, bags	lb.	.05½ –	.06
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.04½ –	....
Crude, scale 124-126 m.p. bags	lb.	.03½ –	....
Ref., 118-120 m.p., bags	lb.	.03½ –	....
Ref., 125 m.p., bags	lb.	.04 –	....
Ref. 128-130 m.p., bags	lb.	.04½ –	....
Ref., 133-135 m.p., bags	lb.	.04½ –	.05
Ref., 135-137 m.p., bags	lb.	.05½ –	....
Stearic acid, agle pressed, bags	lb.	.12½ –	.12¾
Double pressed, bags	lb.	.13 –	.13½
Triple pressed, bags	lb.	.14½ –	.14¾

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$8.00 –	$8.25
Ammonium sulphate, bulk f.o.b. works	100 lb.	$2.85 –	$2.90
Blood, dried, bulk	unit	4.10 –	4.15
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	4.40 –	....
Nitrate of soda, bags	100 lb.	2.45 –	....
Tankage, high grade, f.o.b. Chicago	unit	3.25 –	3.35
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	4.00 –	4.50
Tennessee, 78-80%	ton	7.75 –	8.00
Potassium muriate, 80%, bags	ton	34.55 –	....
Potassium sulphate, bags basis 90%	ton	45.85 –	....
Double manure salt	ton	27.00 –	....
Kainit	ton	7.22 –	....

Crude Rubber

Para—Upriver fine	lb.	$0.23½ –	....
Upriver coarse	lb.	.19½ –	....
Upriver caucho ball	lb.	.20 –	....
Plantation—First latex crepe	lb.	.27½ –	....
Ribbed smoked sheets	lb.	.27 –	....
Brown crepe, thin, clean	lb.	.26 –	....
Amber crepe No. 1	lb.	.26½ –	....

Gums

Copal, Congo, amber, bags	lb.	$0.10 –	$0.15
East Indian, bold, bags	lb.	.21 –	.22
Manila, pale, bags	lb.	.19 –	.20
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.25 –	....
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb	.64 –	.66
Ordinary chips, cases	lb.	.21 –	.23
Manjak, Barbados, bags	lb.	.09 –	.14

Shellac

Shellac, orange fine, bags	lb.	$0.65 –	$0.66
Orange superfine, bags	lb.	.67 –	.68
A. C. garnet, bags	lb.	.65 –	....
Bleached, bonedry	lb.	.73 –	.74
Bleached, fresh	lb.	.60 –	....
T. N., bags	lb.	.61 –	.63

Miscellaneous Materials

Asbestos, crude No. 1, f.b. Quebec	sh. ton	$325.00 –	$450.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$50.00 –	$60.00
Asbestos, cement, f.o.b., Quebec	sh. ton	17.00 –	20.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	15.00 –	18.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	13.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	26.00 –	....
Barytes, crude f.o.b. mines, bulk	net ton	7.00 –	10.00
Casein, bbl., tech.	lb.	.11½ –	.14½
China clay (kaolin) crude, f.o.b. Ga.	net ton	6.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	7.00 –	8.00
No. 2 pottery	long ton	6.50 –	....
No. 1 soap	long ton	8.50 –	....
No. 1 Canadian, f.o.b. mill, powd.	long ton	20.00 –	....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06 –	.06½
Ceylon, chip, bbl.	lb.	.04½ –	.07
High grade amorphous crude	ton	15.00 –	30.00
Gum arabic, amber, sorts, bags	lb.	.13½ –	.14½
Gum tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.40 –	1.45
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N.Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05½
Dom., ground, bbl.	lb.	.05½ –	.06
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50	5.00
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	....
Silica, glass sand, f.o.b. Ill.	ton	1.50 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	6.50 –	8.50
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 350 mesh, f.o.b. New York, grade A bags	ton	22.00 –	....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.35 –	2.60
Corning	bbl.	1.25 –	....
Cabell	bbl.	1.20 –	....
Somerset	bbl.	1.15 –	....
Illinois	bbl.	1.22 –	....
Indiana	bbl.	1.23 –	....
Kansas and Oklahoma, 28 deg.	bbl.	.50 –	....
California, 35 deg. and up	bbl.	.76 –	....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.15½ –	....
Naphtha, V. M. & P. deod, steel bbls.	gal	.14½ –	....
Kerosene, ref. tank wagon	gal.	.15 –	....
Bulk, W.W. delivered, N.Y.	gal.	.09 –	....
Lubricating oils:			
Cylinder, Penn., dark	gal.	.24 –	....
Bloomless, 30@31 grav.	gal.	.17½ –	....
Paraffin, pale	gal.	.16½ –	.17
Spindle, 200, pale	gal.	.21 –	.21½
Petrolatum, amber, bbls.	lb.	.03½ –	.04
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–145
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42–45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35–38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	50–53
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	50–53
F.o.b. Mt. Union, Pa.	1 000	42–45
Silicon carbide refract. brick, 9-in.	1,000	1180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	$225.00

Ferrochromium, per lb. of Cr, 1-2% C	lb.	.28 –	.30
4-6% C	lb.	.12 –	...
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	110.00 –	.....
Spiegeleisen, 19-21% Mn	gr. ton	42.00 –	45 00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-12%	gr. ton	43.00 –	50.00
50%	gr. ton	82.50 –	85.00
Ferrotungsten, 70-80%, per lb. of W	lb.	$0.88 @	$0.90
Ferro-uranium, 35-50% o U. per lb. of U	lb.	4.50 –	....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 –	4.50

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	23.00
C.i.f. Atlantic seaboard	ton	19.25 –	21.25
Coke, fdry., f.o.b. ovens	ton	5.00 –	5.50
Coke, furnace, f.o.b. ovens	ton	4.00 –	4.25
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 –	.....
Ilmenite, 52% TiO_2	lb.	.00½ –	.01
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.42 –	.....
Manganese ore, chemica (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.75 –	.....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f Atl. seaport	unit	.11½ –	.12
Pyrites, Span., furnace size c.i.f. Atl. seaport	unit	.11½ –	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	.....
Rutile, 95% TiO_2	lb.	.10 –	.....
Tungsten, scheelite, 60% WO_3 and over	unit	9.50 –	10.00
Tungsten, wolframite, 60% WO_3	unit	8.50 –	9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 –	2.50
Vanadium pentoxide, 99%	lb.	12.00 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 –	1.00
Zircon	ton	80.00 –	.....

Non-Ferrous Metals

Copper, electrolytic	lb.	.13–.13¼
Aluminum, 98 to 99%	lb.	.26–.28
Antimony, wholesale, Chinese and Japanese	lb.	.08¾–.08¾
Nickel, 99%	lb.	.27 – .30
Monel metal, shot and blocks	lb.	.32
Monel metal, ingots	lb.	.38
Monel metal, sheet bars	lb.	.45
Tin, 5-ton lots, Straits	lb.	.47½
Lead, New York, spot	lb.	.07½
Lead, E. St. Louis, spot	lb.	.07¼
Zinc, spot, New York	lb.	.06½
Zinc, spot, E. St. Louis	lb.	.06¼
Silver (commercial)	oz.	.64¼
Cadmium	lb.	.75
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25–.....
Platinum	oz.	125.00
Iridium	oz.	275.00@300.00
Palladium	oz.	83.00
Mercury	75 lb.	60.00
Tungsten	lb.	.95–1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.25
Copper bottoms	29.75
Copper rods	19.75
High brass wire	18.00
High brass rods	15.75
Low brass wire	20.25
Low brass rods	20.50
Brazed brass tubing	23.50
Brazed bronze tubing	27.00
Seamless copper tubing	25.50
Seamless high brass tubing	24.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	9.00@ 9.50
Copper, heavy and wire	10.25@10.50
Copper, light and bottoms	8.50@ 8.75
Lead, heavy	5.50@ 5.62½
Lead, tea	3.50@ 3.75
Brass, heavy	6.00@ 6.25
Brass, light	5.25@ 5.50
No. 1 yellow brass turnings	5.75@ 6.00
Zinc scrap	3.75@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3 64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Arizona

PATAGONIA—The Arizona-Kuenzel Smelting Co., Nogales, Ariz., has plans for the construction of a local smelting plant, with initial capacity of about 25 tons per day, and will commence work at an early date. Fred W. Kuenzel, Nogales, heads the company.

California

OAKLAND—The Dewey & Almy Chemical Co., Cambridge, Mass., manufacturer of adhesives, sealing compounds, chemical specialties, etc., has acquired property at East 8th St. and 40th Ave., and will immediately commence the erection of a new branch plant for Pacific Coast trade. A general contract has been awarded to Barr & Son, 306 26th St., Oakland. It will cost about $27,000. Bradley Dewey is president.

HUNTINGTON PARK—The Gypsum Tile Factory, Inc., will commence the construction of a new plant on site secured in the industrial section, near Slauson Ave. It will consist of a main 1-story building, with auxiliary structures, equipped for an initial output of 150,000 ft. of gypsum partition tile per month. N. J. Martin heads the company. A. J. Bruct, Los Angeles, is also interested in the project.

District of Columbia

WASHINGTON—The United States Engineer Office, Old Land Bldg., 8th and F Sts., N. W., has plans nearing completion and will take bids at an early date for the installation of a filtration plant, in connection with a hydro-electric power station on site in Maryland. Major N. C. Tyler is in charge.

Florida

SEBRING—The Granite Brick & Block Co., recently organized, has commenced operations at a local plant for the manufacture of hollow cement tile and kindred products. Additional mixing machinery and other equipment will be installed. It is purposed to develop an extensive capacity, with department for the production of cement posts and ornamental cast cement products. W. M. Baker and H. L. Kelly head the company.

Illinois

CHICAGO—The Union Asbestos & Rubber Co., 169 Quincy St., has acquired property on West 54th Ave., near 16th St., heretofore held by the LaSalle Woodworking Co., to be used for plant extensions. The company is now operating a factory at 2834 Loomis St.

CHICAGO — The South Side Paper Stock Co., 5838 Throop St., is perfecting plans for the rebuilding of the portion of its 2-story and basement plant, recently partly destroyed by fire. The work is estimated to cost $25,000. Robert Colbus is president.

CHICAGO—Fritzsche Brothers, Inc., 35 West Kinzie St., manufacturer of essential oils, etc., has awarded a general contract to C. L. Carlsen, 4836 North Harding Ave., for the erection of a 3-story plant, 25x32 ft., at 118 West Ohio St. Plans have been filed and work will proceed at once. J. A. Miller, 155 North Clark St., is architect.

NEWTON—The city council, John Matheny, city clerk, is having plans drawn for a filtration plant and system at the municipal waterworks, estimated to cost $30,000. The Caldwell Engineering Co., Jacksonville, Ill., is engineer.

Kentucky

LOUISVILLE—Richard D. Bakrow & Sons, Inc., recently formed with a capital of $75,000, will operate a local plant for the manufacture of rubber specialties, including toys, etc. Richard E. and James C. Bakrow, both of Louisville, head the company.

Louisiana

MONROE—The Southern Chemical Co., recently organized under state laws with a capital of $250,000, is perfecting plans for a local plant for the manufacture of calcium arsenate and kindred products, primarily for the eradication of the boll weevil. The initial plant is estimated to cost $75,000, and will have a daily output of about 7 tons. Francis E. Goodwin, Monroe, is secretary and treasurer.

Maryland

BALTIMORE—The Pittsburgh Plate Glass Co., Frick Bldg., Pittsburgh, Pa., has awarded a general contract to the Charles L. Stockhausen Co., Water St., Baltimore, for the erection of a 4-story addition to its local plant on Frederick St., operated in the name of the Rennous-Kleinle Division, 60x140 ft., estimated to cost $100,000. Foundations will be laid at once.

AMCELLE—The American Cellulose & Chemical Mfg. Co., Ltd., has awarded a general contract to the Austin Co., Philadelphia, Pa., for the construction of 9 new plant units at its local chemical and artificial silk works. The structures are estimated to cost about $2,000,000, including machinery. At a later date it is purposed to erect other extensions to cost about $5,000,000. The plant will have a rated output of 1 ton of artificial silk per day. Dr. Camille Drayfus is president.

BALTIMORE—The United States Industrial Chemical Co., Fairfield, has filed plans for the erection of a 1-story extension.

BALTIMORE—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron sanitary ware, etc., has filed plans for the erection of seventeen 1-story buildings for its proposed new plant at 5th Ave. and 17th St., Canton, for which contracts have been let to the B. A. Groach Construction Co. and the Fort Pitt Bridge Co., both of Pittsburgh. The works will be devoted largely to the production of sanitary plumbing fixtures, and with equipment will cost about $3,000,000. H. M. Reed, Pittsburgh, is assistant general manager.

Massachusetts

BOSTON—The Hollingsworth & Whitney Co., 185 Devonshire St., manufacturer of paper products, with mills at Waterville and Gardiner, Me., is completing plans and will soon break ground for the construction of a new pulp and paper mill on the St. Croix River, St. Stephen, N. B., opposite Calais, Me. It will consist of a number of units, with power house, estimated to cost in excess of $400,000, including equipment.

WORCESTER—The Globe Mfg. Co., manufacturer of celluloid products, will commence the construction of a new 1-story plant, 100x125 ft., at 129 Dewey St., for considerable increase in output. It is purposed to remove the present works to the new location.

BROCKTON—The Triangle Stain & Blacking Co., recently organized, has leased space in the building at 66 East Railroad Ave., for the establishment of a new plant for the manufacture of blackings, finishes, tanning materials, etc. John Higgins and William Brady head the company.

Michigan

HOUGHTON—The National Humus & Chemical Co., Guardian Bldg., Cleveland, O., is planning for the rebuilding of the portion of its plant at Chassell, near Houghton, recently destroyed by fire.

DETROIT—The Peerless Portland Cement Co., Union City, Mich., has commissioned Albert Kahn, 1000 Marquette Bldg., Detroit, architect, to prepare plans for its proposed mill on site at River Rouge, recently acquired, to consist of a series of 1- and 2-story buildings, estimated to cost $3,500,000, with machinery. Bids will be asked in the near future. A. F. Miller, Jackson, Mich., is consulting engineer for the project.

New Jersey

BAYONNE—Fire, Nov. 29, destroyed a portion of the plant of the Bushwick Cork Co., 681 Hudson Blvd., with loss estimated at about $45,000, including equipment. It is planned to rebuild.

KEASBEY—The Raritan Hollow Tile Co. is perfecting plans for the rebuilding of its

local plant, destroyed by fire late in October, with loss estimated at $100,000, including machinery. The new works are estimated to cost approximately a like amount. Robert Lyle is general manager.

BAYONNE—J. M. Huber, Inc., 65 West Houston St., New York, manufacturer of printing inks, etc., has awarded a contract to Smith & Lee, 103 Park Ave., New York, for the erection of a 1-story building at its plant at West 2nd St. and the Hudson Blvd., Bayonne, 120x125 ft., estimated to cost $25,000.

New York

BUFFALO—The Tucker Rubber Corp., Jackson Bldg., recently formed with a capital of $800,000, as a subsidiary of the Federal Rubber Co., Cudahy, Wis., affiliated with the Fisk Rubber Co., Chicopee Falls, Mass., has leased a portion of the former local mill of the Madison Tire & Rubber Co., Spencer St., approximating 100,000 sq.ft. of floor space, for the establishment of a plant for the manufacture of mechanical rubber products. The new company will take over such branch of the business of the Federal company. Machinery will be provided for an initial working force of 500 operatives. Albert Y. Tucker is president and Arthur S. Cullum, secretary and treasurer.

Ohio

CLEVELAND—The Midwest Rubber Co. has leased for a period of 5 years the former plant of the Poulson Rubber Co., which recently removed to Garrettsville, located at Doan Ave. and the Nickel Plate Railroad, East Cleveland, and will equip the plant for early occupancy. It approximates 10,000 sq.ft. of floor space, all of which will be given over to manufacture.

TOLEDO—The Libbey-Owens Sheet Glass Co., Nicholas Bldg., will defer until early in the spring a call for bids for the construction of its proposed plant on neighboring site for the manufacture of plate glass. It will consist of a main 1-story unit, 175x1,000 ft., and auxiliary structures, estimated to cost close to $1,000,000, with machinery. The Devore Co., 808 Nicholas Bldg., is architect and engineer.

Oklahoma

TULSA—The Hanlon Gasoline Co., recently formed under Delaware laws with capital of $1,500,000, as an interest of Chesnutt & Smith Corp., Tulsa, operator of oil refineries, is perfecting plans for the construction of a new gasoline-refining plant, with initial output of 50,000 gal. per day. The new company has also taken over the plant and properties of the Hi-Power Gasoline Corp.

DEWEY—The Dewey Portland Cement Co., 301 Mutual Bldg., Kansas City, Mo., will make extensions in its local plant and install additional equipment. A new 100-ft. kiln and 60-ft. drier will be provided. It is purposed to develop a capacity of 4,000 bbl. per day. F. E. Taylor is president.

Oregon

ASTORIA—The Crown-Willamette Paper Co., Pittock Bldg., Portland, Ore., has plans for the construction of a new pulp mill at the Youngs River Falls, near Astoria, estimated to cost close to $200,000, with equipment. It is expected to commence work at an early date.

Pennsylvania

BLAIRSVILLE—The National Plate Glass Co., Detroit, Mich., has awarded a contract to the McClintic-Marshall Co., Pittsburgh, for the erection of a new addition at its local plant, estimated to cost close to $90,000, with equipment.

COSTELLO—Fire, Nov. 25, destroyed a portion of the local plant of the Elk Tanning Co., with loss reported at $100,000, including equipment. Rebuilding plans are under advisement. Headquarters of the company are at Ridgway, Pa.

STEELTON—The Harrisburg Gas Co., has acquired a tract of 13 acres of land in the northern section of the city, as a site for a new artificial gas-manufacturing plant. The initial unit, to be completed during the coming year, will cost about $500,000, and will be supplemented with another unit at a later date, to cost a like amount. Headquarters of the company are at Harrisburg, Pa.; L. S. Williams is general manager.

Tennessee

COLUMBIA—The Crissey Tire & Rubber Co. has leased property on the Pulaski Turnpike, and plans for the construction of a new plant for the manufacture of automobile tires and tubes, rubber toys, etc. It is estimated to cost about $85,000.

Texas

DALLAS—The Washington Cotton Oil Co., Maple Ave., has preliminary plans under consideration for the rebuilding of the portion of its local mill destroyed by fire, Nov. 22, with loss estimated at $55,000, including equipment. Headquarters of the company are at Memphis, Tenn. W. L. Patton is local manager.

SUGARLAND—The Imperial Sugar Co. has preliminary plans under way for extensions in its plant to cost in excess of $600,000, including machinery. A new charhouse will be erected.

SAN ANTONIO—The San Antonio Portland Cement Co. is planning for extensions in its local plant to cost about $100,000, with equipment. New slurry tanks and other apparatus will be installed. W. E. Simpson, National Bank of Commerce Bldg., is engineer.

West Virginia

FAIRMONT—The Owens Bottle Co. has purchased a tract of 10 acres of land in the vicinity of its local plant and plans to use a portion of the site for early expansion.

CABIN CREEK—The Pure Oil Co., Pure Oil Bldg., Columbus, O., is said to have preliminary plans for the rebuilding of the portion of its local plant, recently destroyed by fire with loss approximating $100,000, including equipment.

Wisconsin

MENASHA—The McGillan-Asmuth Paper Mills, Inc., is considering the construction of an addition to its converting mill, to double the present output.

Industrial Notes

THE UNITED WATER SOFTENERS, LTD., Imperial House, Kingsway, London, W. C. 2, England, which became the sole licensee for the Sharples supercentrifuge 4 years ago, now finds that the business has grown to such an extent that a separate company has had to be formed to deal exclusively with the Sharples business. This company will be known as the Super-Centrifugal Engineers, Ltd. There is no change in directorate or management.

G. BLUEMEL, who has been connected with the Ferguson Furnace Co. for 8 years as chief engineer and vice-president, has joined Tate-Jones & Co., Inc., furnace engineers and builders, and will manage the New York sales district, covering New York, New Jersey and New England, with headquarters at 60 Church St., New York City.

THE AMERICAN NICKEL CORP., Clearfield, Pa., announces that H. F. Chase has been appointed to represent it in the New York City district for the exploitation and sale of its 99 per cent pure malleable nickel and Mond nickel alloys. Mr. Chase will have offices at 350 Madison Ave.

THE WELLER MANUFACTURING CO., Chicago, Ill., manufacturer of elevating, conveying and power-transmitting machinery, has appointed F. A. Klopp, a graduate engineer, as a new representative. He will be located at 1401 Lexington Bldg., Baltimore, Md. The Stratton-Cahoon Co., 809 McIntyre Bldg., Salt Lake City, Utah, will look after the sales in the Northwest territory; and for the Omaha territory, a sales office has been opened at 627 Grain Exchange Bldg., Omaha, Neb., which will be in charge of O. F. Barklage, of the Industrial Sales & Engineering Co.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

CALCIUM CARBIDE, heavy and light chemicals, paints and varnishes, Calcutta, India. Purchase and agency.—8360.

CORNSTARCH, glucose, and gelatin. Dublin, Ireland. Purchase.—8368.

LINSEED CAKE and linseed and cottonseed meals. Liverpool, England. Purchase.—8345.

OLEO OIL. Saloniki, Greece. Agency.—8374.

TIN PLATE, 500 tons. Naples, Italy. Agency.—8329.

LEATHER, ARTIFICIAL, for automobile tops. Warsaw, Poland. Purchase.—8375.

New Companies

GENERAL CHEMICAL CO., Shreveport, La.; chemicals and chemical byproducts; $60,000. J. F. Cunningham is president, and H. Clay Brown secretary and treasurer, both of Shreveport.

STAR RUBBER GOODS MFG. CO., 189 North Clark St., Chicago, Ill.; rubber products; $10,000. Incorporators: Maurice B. Brand, Samuel R. Rabinoff and Arnold M. Ehrlich.

A. B. PUGSLEY, INC., Malden, Mass.; oils, greases, tanning materials, etc.; $25,000. Arthur B. Pugsley is president, and John O'Brien, Jr., Amesbury, Mass., treasurer and representative.

SIDNEY BRASS WORKS CO., Sidney, O.; brass and bronze products; $10,000. Incorporators: George Trautman and Morris Semmelman, both of Sidney.

BIENENFELD GLASS WORKS, INC., Brooklyn, N. Y.; glass products; $75,000. Incorporators: H. L., M., and S. Bienenfeld. Representative: L. C. Wills, 32 Court St., Brooklyn.

OPERATORS OIL CO., Heyworth, Ill.; petroleum products; $100,000. Incorporators: G. W. Powell, Charles Schoeffel and O. J. Houghan. Representative: C. B. Hughes, 518 Griesheim Bldg., Bloomington, Ill.

OHIO CHEMICAL CO., Columbia, S. C.; chemicals and chemical byproducts; $12,000. C. P. Gilbert is president, and C. H. Durant vice-president and secretary.

MID-CONTINENTAL RUBBER CO., Wilmington, Del.; rubber products; $10,000,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

AMERICAN LITHOGRAPHIC VARNISH CO., Newark, N. J.; varnishes, oils, etc.; $50,000. Incorporators: John DeMauro and Walter L. Roder. Representative: Salvatore DeMauro, 26 Lexington St., Newark.

MECCA OIL CO., Steubenville, O.; oil products; $50,000. Incorporators: Charles S. Kelly and Oscar V. Cole, both of Steubenville.

GELATIN GLUE PRODUCTS CO., Pittsburgh, Pa.; being organized to manufacture glue, gelatin, composition products, etc.; application for a state charter will be made on Dec. 18. Incorporators: J. L. Sherrick and Charles K. White. Representative: J. Warren Hunter, 1222-3 Park Bldg., Pittsburgh.

PORTLAND PULP & PAPER CO., Portland, Ore.; paper and pulp products; $1,500,000. Incorporators: D. E. Fry and F. D. Thielsen, Salem, Ore.; and Roy H. Mills, Portland.

FIDELITY CHEMICAL CO., Kansas City, Mo.; chemicals and chemical byproducts; $9,000. Incorporators: C. J. Bonar and M. L. Sudsberry, 2818 Troost St., Kansas City.

NEW ENGLAND EXPLOSIVES CO., Portland, Me.; powder, dynamite, etc.; 100 shares of stock, no par value. Edward L. Fenn is president, and William H. Fenn, 3d, treasurer and clerk, both of Portland.

INDUSTRIAL ALCOHOL & CHEMICAL CO., Philadelphia, Pa.; chemicals, alcohol products, etc.; $100,000. Incorporators: Simon S. Neuman, Harry Publicker and Joseph Egendorf, all of Philadelphia. Representative: Capital Trust Co. of Delaware, Dover, Del.

DAMASCAN CHEMICAL MFG. CO., New York; chemicals and chemical byproducts; 150 shares of common stock, no par value. Incorporators: G. C. Booth, H. B. Delaney, Jr., and J. W. Wiggins. Representative: F. E. Rivers, 366 Broadway, New York.

HICKS RUBBER CO., Temple, Tex.; rubber products; $15,000. Incorporators: H. R. Heggie and D. T. Hicks, both of Temple.

BRYANT OIL CO., INC., Newark, N. J.; oil products; $100,000. Incorporators: Charles Bobker and C. Preuss. Representative: David Bobker, 738 Broad St., Newark.

C. & S. PAINT PRODUCTS CO., Long Island City, N. Y.; paints, varnishes, oils, etc.; $50,000. Incorporators: R. A. Keppler, O. J. Slacht and C. White. Representative: Creamer & Gilman, Long Island City.

MAYER CHINA CO., Beaver, Pa.; chinaware and other pottery; nominal capital $5,000. Arthur E. Mayer, 179 Taylor Ave., Beaver, is treasurer and representative.

FIBRE PRODUCTS CORP., Hoboken, N. J.; fiber specialties; $50,000. Incorporators: Edward Hollander, Max Levitin and John J. Kelsch, 1404 Willow Ave., Hoboken. The last noted is representative.

PARKER RUST-PROOF CO., Buffalo, N. Y.; special compounds for preventing iron and steel rusting; $18,000. Incorporators: R. C. and G. R. George. Representative: C. A. Hamlin, attorney, Buffalo.